National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SETs 7000 - 7599 (DSI-7000)

NEXRAD LEVEL III

December 13, 2002

National Climatic Data Center
151 Patton Ave.
Asheville, NC 28801-5001 USA

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Table of Contents

Topic	Page Number
1. Abstract	3
2. Element Names and Definitions:	3
3. Start Date	101
4. Stop Date	101
5. Coverage	101
6. How to order data	101
7. Archiving Data Center.	102
8. Technical Contact	102
9. Known Uncorrected Problems	102
10. Quality Statement	102
11. Essential Companion Data Sets	102
12. References	102

1. **Abstract**: Weather Surveillance Radar - 1988 Doppler (WSR-88D), or NEXt Generation RADar (NEXRAD), Level III data are the radar product data generated from the Level II base data to assist forecasters in weather analysis, predictions and warnings. The Level III data have been recorded on WORM Optical Disks at National Weather Service sites since the early 1990s. By the year 2000 the data should be provided as a digital data stream from an NWS Central Collection Facility and the NCDC plans to provide the Level III data in digital files each containing an individual product. The data on optical disk is being copied to a digital mass-storage system at NCDC.

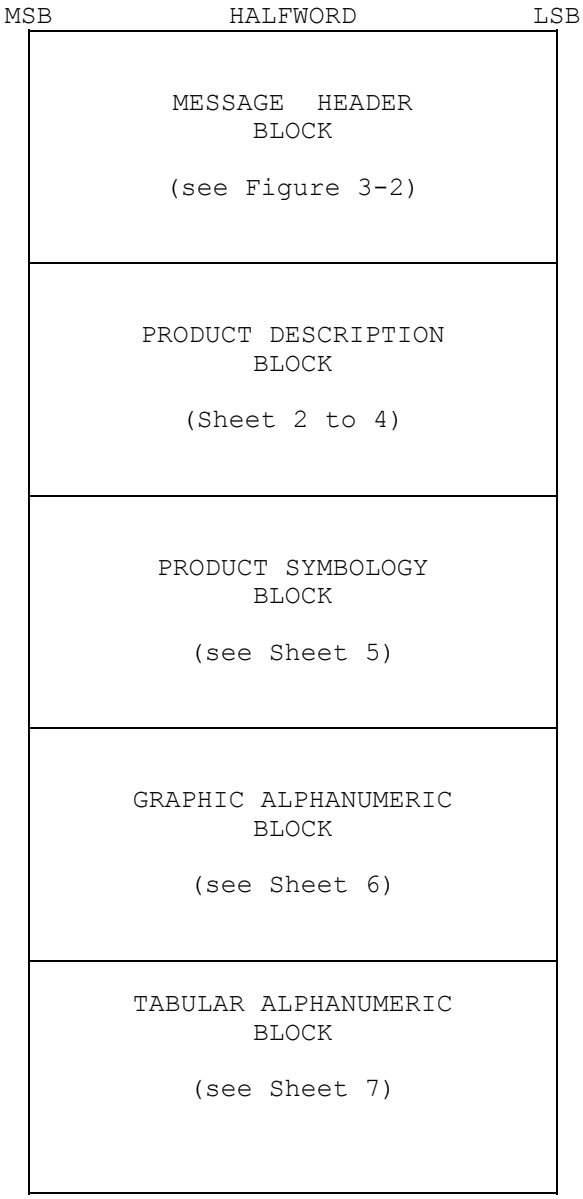
Optical disks containing Level III data are received at the National Climatic Data Center (NCDC) from the individual radar sites. The disks are processed and inventories are produced. As time premits, the data on disk is extracted and stored on the NCDC Heirarchical Data Storage System (HDSS). Data on the HDSS may be requested through the NCDC Home Page. Any Level III data, whether stored on or off the HDSS, may be requested through the standard procedures for ordering data from the NCDC User Services Division.

The data are archived on optical disks received from each site in order by date/time. There are numerous products on the disks with unique formats. The standard products available are listed below and the format type is indicated. Details of the specific formats are provided following this list and are copied from the NWS Interface Control Document for RPG/Associated PUP #2620001.

2. **Element Names and Definitions**:

PRODUCT NAME	NUMBER	FORMAT TYPE
Base Reflectivity, 124nm elev. 1	19	Radial
Base Velocity, 124nm elev. 1	27	Radial
VAD Wind Profile	48	Alphanumeric
Echo Tops	41	Raster
Vertically Integrated Liquid	57	Raster
1-Hour Precipitation Accumulation	78	Raster
Storm Total Precipitation	80	Raster
Composite Reflectivity, 248nm 8-level	36	Raster
Composite Reflectivity, 248nm 16-level	38	Raster
Mean Radial Velocity, 32nm	25	Radial
Spectrum Width, 32nm elev. 1	28	Radial
Spectrum Width, 124nm elev. 1	30	Radial
Digital Precipitation Array	81	Raster
Supplemental Precipitation Data	82	Raster
Radar Coded Message	74	Alphanumeric
Storm Structure	62	Alphanumeric
Significant Weather Overlay-		
Hail Index	59	Alphanumeric
Mesocyclone	60	Alphanumeric
Severe Weather Probability	47	Alphanumeric
Storm Tracking Information	58	Alphanumeric
Tornado Vortex Signature	61	Alphanumeric

FORMATS:



Note: All blocks need not be used. Any blocks that are used must remain in the order shown.

Figure 3-5. Graphic Product Message

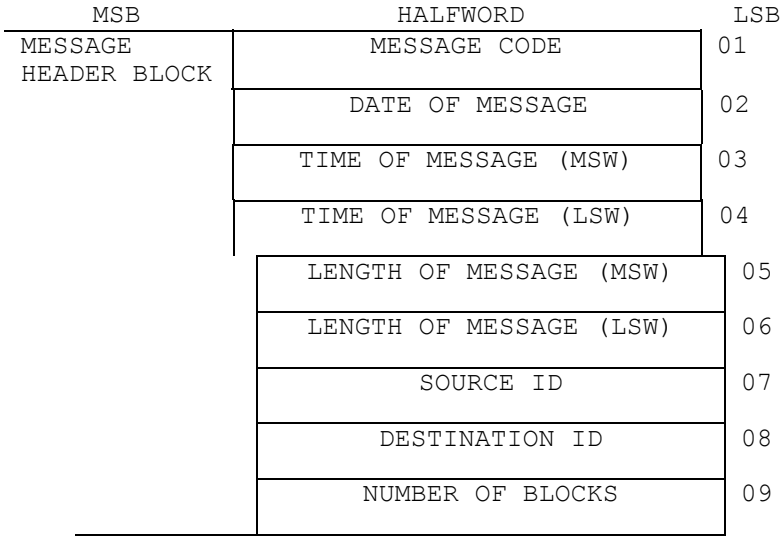


Figure 3-2. Message Header (Sheet 1 of 2)

HALFWORD	FIELDNAME	TYPE	UNITS	RANGE	PRECISION / ACCURACY	REMARKS
01	Message Code	INT*2	N/A	-131 to -16, 0 to +211	N/A	NEXRAD Message Code defined in Table II
02	Date of Message	INT*2	Julian Date	1 to 32,767	1	Modified Julian Date at time of transmission (number of days since 1 January 1970, where 1=1 January 1970). To obtain actual Julian Date, add 2,440,586.5 to the modified date
03-04	Time of Message	INT*4	Seconds	0 to 86,399	1	Number of seconds after midnight, Greenwich Mean Time (GMT).
05-06	Length of Message	INT*4	N/A	18 to 409856	1	Number of bytes in message including header
07	Source ID	INT*2	N/A	0 to 999	1	Source (originators') ID of the sender
08	Destination ID	INT*2	N/A	0 to 999	1	Destination ID (receivers') for message transmission
09	Number Blocks	INT*2	N/A	1 to 51	1	Header Block plus the Product Description Blocks in message

Figure 3-2. Message Header (Sheet 2 of 2)

Table II. NEXRAD Message Code Definitions

MESSAGE CODE	MESSAGE TYPE	FIGURE
0,13	Product Request, Product Request	3-3
1	Cancel Spare	-
2	General Status	3-17
3	Request Response	3-18
4	Maximum Connection Time Disable	N/A
5	Request	-
6	Spare	3-20
7	Alert Adaptation Parameter Message	3-4
8	Alert Request Message	3-21
9	Product List	3-19
10	Alert Message	3-23
11	Radar Coded Message Edit/No Edit	N/A
12	Request	N/A
14	Sign-on Request Message (Dial -up Users) Request PUP/RPGOP Status PUP/RPGOP to RPG Status	3-24
16 to 109	Products (See Table III for individual Product Codes)	
110 to 131	Reserved for future Products	
132	Reserved for Internal PUP Use (Polar Grid)	
136	LFM Grid	
140	Reserved for Internal PUP User (Range Rings)	
142	River Basins	
144	Rivers	
146	Airway Low	
148	Airway High	
152	Counties	
156	States	
160	Airports	
164	Reserved for Internal PUP Use (RDA Site)	
172	Highways	
176	NAVAIDS	
182	Warning Area	
184	Military Operations Area	
188	Restricted Area	
192	Prohibited Area	
194	Radar Sites	
196	County Names	
198	Cities	
199 to 211	Spares	

Negative	Annotations have a negative message code equal in magnitude to that of the Product being annotated

Table IIa. Product Dependent Halfword Definitions for Product Request Message

Product Name	Msg Code (s)		Content	Units (INT*2)	Range	Accuracy/ Precision
Base Products	16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30	22	Elevation Angle	Degrees	-1.0 to 45.0	.1, Note 1
Echo Top Contour	42	25	Contour Interval	Feet	2000 to 30,000	1000
Severe Weather Analysis	43, 44, 45, 46	20 21 22	Azimuth of Window Center Range of Window Center Elevation Angle	Degree Nmi Degree	0 to 359.9 0 to 124.0 -1.0 to 45.0	.1, Note 1 .1, Note 1 .1, Note 1
Cross Section	50, 51, 52, 85, 86	20 21 22 23	Azimuth of Point 1 Range of Point 1 Azimuth of Point 2 Range of Point 2	Degree Nmi Degree Nmi	0 to 359.9 0 to 124.0 Same as Point 1 Same as Point 1	.1, Note 1 .1, Note 1 .1, Note 1 .1, Note 1
Weak Echo Region	53	20 21 23, 24	Azimuth of Window Center Range of Window Center Bit Map	Degree Nmi N/A	0 to 359.9 0 to 124.0 0,1/bit	.1, Note 1 .1, Note 1 N/A, Note 4
Storm Relative Mean Radial Velocity Region	55	20 21 22 23 24	Azimuth of Window Center Range of Window Center Elevation Angle Storm Speed Storm Direction	Degree Nmi Degree Knots Degrees	0 to 359.9 0 to 124.0 -1.0 to 45.0 0 to 99.9 0 to 359.9	.1, Note 1 .1, Note 1 .1, Note 1 .1, Note 1,2 .1, Note 1
Storm Relative Mean Radial Velocity Map	56	22 23 24	Elevation Angle Storm Speed Storm Direction	Degree Knots Degrees	-1.0 to 45.0 0 to 99.9 0 to 359.9	.1, Note 1 .1, Note 1,3 .1, Note 1

VAD	84	22	Altitude	K Feet	0 to 70	1
Combined Moment	49	20 21 22	Azimuth of Window Center Range of Window Center Elevation Angle	Degree Nmi Degree	0 to 359.9 0 to 124.0 -1.0 to 45.0	.1, Note 1 .1, Note 1 .1, Note 1
User Selectable Precipitation (Note 5)	31	20 21	End Hour Time Span	Hours Hours	-1.0 to 23, 1 to 24	1, Note 6 1
Clutter Filter Control (Note 5)	34	20	Bit Map	N/A	0,1 bit	N/A, Note 7

Note 1. Scaled Integer.

Note 2. A value of -1. indicates that the storm motion is that of the storm closest to the window center.

Note 3. A value of -1 indicates that the storm motion is that of the vector average of all currently identified storms.

Note 4. Defines up to eight user selected elevation angles available in the current scan strategy. Scan strategy may contain 20 cuts. Each elevation cut selection is represented by a unique bit setting. Bit 1 of halfword 23 corresponds to elevation cut #1. Bit 4 of halfword 24 corresponds to elevation cut #20. Bit 0 of halfword 23 is the MSB and is not used.

Note 5. One time requests for this product should use the "latest available" request option. That is, place -2 in the volume scan start time field (halfword 18-19).

Note 6. A value of -1 indicates that the end time will be the time of the most recent hourly update.

Note 7. Defines the clutter map segment number and channel type. Bit 15 defines the channel type. If bit 15 is 0, then the surveillance channel map is requested. If bit 15 is 1, then the Doppler channel map is requested. Bits 14 through 10 specify evaluation segment numbers 1 through 5, respectively. Set the bit number of the segment being requested. Segment 1 is the lowest clutter filter map, segment 2 is the upper clutter filter map. Segments 3 through 5 are for future expansion.

Table III. Message Codes for Products

CODE	NTR	PRODUCT NAME	RESOLUTION	RANGE	DATA Level	MESSAGE FORMAT
16	1	Base Reflectivity	.54 x 1 Nmi x Deg	124	8	Radial Image
17	1	Base Reflectivity	1.1 x 1 Nmi x Deg	248	8	Radial Image
18	1	Base Reflectivity	2.2 x 1 Nmi x Deg	248	8	Radial Image
19	1	Base Reflectivity	.54 x 1 Nmi x Deg	124	16	Radial Image
20	1	Base Reflectivity	1.1 x 1 Nmi x Deg	248	16	Radial Image
21	1	Base Reflectivity	2.2 x 2 Nmi x Deg	248	16	Radial Image
22	2	Base Velocity	.13 x 1 Nmi x Deg	32	8	Radial Image
23	2	Base Velocity	.27 x 1 Nmi x Deg	62	8	Radial Image
24	2	Base Velocity	.54 x 1 Nmi x Deg	124	8	Radial Image
25	2	Base Velocity	.13 x 1 Nmi x Deg	32	16	Radial Image
26	2	Base Velocity	.27 x 1 Nmi x Deg	62	16	Radial Image
27	2	Base Velocity	.54 x 1 Nmi x Deg	124	16	Radial image
28	3	Base Spectrum Width	.13 x 1 Nmi x Deg	32	8	Radial Image
29	3	Base Spectrum Width	.27 x 1 Nmi x Deg	62	8	Radial Image
30	3	Base Spectrum Width	.54 x 1 Nmi x Deg	124	8	Radial Image
31	32	User Selectable Storm Total Precipitation	1.1x1 NmixDeg	124	16	Radial Image/Geographic Alpha
32	33	Digital Hybrid Scan Reflectivity	.54x1 Nmi x Deg	124	256	Radial Image
33	29	Digital Storm Total Precipitation	1.1x1 Nmi x Deg	124	256	Radial Image
34	34	Clutter Filter Control	1 x 1.4 Km x Deg	124	8	Radial Image
35	6	Composite Reflectivity	.54 x .54 Nmi x Nmi	124	8	Raster Image/Non-geographic Alpha
36	6	Composite Reflectivity	2.2 x 2.2 Nmi x Nmi	248	8	Raster Image/Non-geographic Alpha
37	6	Composite Reflectivity	.54 x .54 Nmi x Nmi	124	16	Raster Image/Non-geographic Alpha
38	6	Composite Reflectivity	2.2 x 2.2 Nmi x Nmi	248	16	Raster Image/Non-geographic Alpha
39	7	Composite Reflectivity Contour	.54 x .54 Nmi x Nmi	124	N/A	Linked Contour Vectors/Set Color/Non-geographic Alpha.
40	7	Composite Reflectivity Contour	2.2 x 2.2 Nmi x Nmi	248	N/A	Linked Contour Vectors/Set Color/Non-geographic Alpha.
41	8	Echo Tops	2.2 x 2.2 Nmi x Nmi	124	16	Raster Image

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42	9	Echo Tops Contour	2.2 x 2.2 Nmi x Nmi	124	N/A	Linked Contour Vectors/Set Color/Non-geographic Alpha.
43	10	Severe Weather (Reflectivity)	.54 x 1 Nmi x Deg	27	16 Ref	Radial Image (Reflectivity)
44	10	Severe Weather (Velocity)	.13 x 1 Nmi x Deg	27	16 Vel	Radial Image (Velocity)
45	10	Severe Weather (Spectrum Width)	.13 x 1 Nmi x Deg	27	8	Radial Image (Spectrum Width)
46	10	Severe Weather (Shear)	.27 x 1 Nmi x Deg	27	16 Sh	Radial Image (Shear)
47	11	Severe Weather Probability	2.2 x 2.2 Nmi x Nmi	124	N/A	Geographic Alphanumeric
48	12	VAD Wind Profile	5 Knots	N/A	5	Non-geographic Alphanumeric
49	13	Combined Moment	.27 x .27 Nmi x Nmi	13.5	16	Raster Image/Non-geographic Alphanumeric
50	14	Cross Section (Reflectivity)	.54 Horizontal x .27 Vert Nmi x Nmi	124	16	Raster Image (Reflectivity)
51	14	Cross Section (Velocity)	.54 Horizontal x .27 Vert Nmi x Nmi	124	16	Raster Image (Velocity)
52	14	Cross Section (Spectrum Width)	.54 Horizontal x .27 Vert Nmi x Nmi	124	8	Raster Image (Spectrum Width)
53	15	Weak Echo Region	.54 x .54 Nmi x Nmi	27	8	Raster Image/Non-geographic Alpha.

Note: For all message codes for products: Units is N/A, Range is 0 to value shown and Accuracy/Precision is 1.

Table III. Message Codes for Products (Con't)

CODE	NTR	PRODUCT NAME	RESOLUTION	RANGE	DATA LEVEL	MESSAGE FORMAT
54	---------- Reserved ---------					
55	16	Storm Relative Mean Radial Velocity	.27 x 1 Nmi x Deg	27	16	Radial Image (Region)
56	16	Storm Relative Mean Radial Velocity	.54 x 1 Nmi x Deg	124	16	Radial Image (Map)
57	17	Vertically Integrated Liquid	2.2 x 2.2 Nmi x Nmi	124	16	Raster Image
58	18	Storm Tracking Information	N/A	248	N/A	Geographic and Non-geographic Alpha
59	19	Hail Index	N/A	124	N/A	Geographic and Non-geographic Alpha
60	20	Mesocyclone	N/A	124	N/A	Geographic and Non-geographic Alpha
61	21	Tornado Vortex Signature	N/A	124	N/A	Geographic and Non-geographic Alphanumeric
62	22	Storm Structure	N/A	248	N/A	Alphanumeric
63	23	Layer Composite Reflectivity	2.2 x 2.2 Nmi x Nmi	124	8 Avg	Raster Image (Layer 1 Average)
64	23	Layer Composite Reflectivity	2.2 x 2.2 Nmi x Nmi	124	8 Avg	Raster Image (Layer 2 Average)
65	23	Layer Composite Reflectivity	2.2 x 2.2 Nmi x Nmi	124	8 Max	Raster Image (Layer 1 Maximum)
66	23	Layer Composite Reflectivity	2.2 x 2.2 Nmi x Nmi	124	8 Max	Raster Image (Layer 2 Maximum)
67	24	Layer Composite Turbulence	2.2 x 2.2 Nmi x Nmi	80	8 Avg	Raster Image (Layer 1 Average)
68	24	Layer Composite Turbulence	2.2 x 2.2 Nmi x Nmi	80	8 Avg	Raster Image (Layer 2 Average)
69	24	Layer Composite Turbulence	2.2 x 2.2 Nmi x Nmi	80	8 Avg	Raster Image (Layer 3 Average)
70	24	Layer Composite Turbulence	2.2 x 2.2 Nmi x Nmi	80	8 Max	Raster Image (Layer 1 Maximum)
71	24	Layer Composite Turbulence	2.2 x 2.2 Nmi x Nmi	80	8 Max	Raster Image (Layer 2 Maximum)
72	24	Layer Composite Turbulence	2.2 x 2.2 Nmi x Nmi	80	8 Max	Raster Image (layer 3 Maximum)
73	25	User Alert Message	N/A	N/A	N/A	Alphanumeric
74	26	Radar Coded Message	1/16 LFM	248	9	Alphanumeric
75	27	Free Text Message	N/A	N/A	N/A	Alphanumeric
76	---------- Reserved for internal PUP use ----------					

77	27	PUP Free Text Message	N/A	N/A	N/A	Alphanumeric
78	28	Surface Rainfall Accum. (1 hr)	1.1 x 1 Nmi x Deg	124	16	Radial Image
79	28	Surface Rainfall Accum. (3 hr)	1.1 x 1 Nmi x Deg	124	16	Radial Image
80	29	Storm Total Rainfall Accumulation	1.1 x 1 Nmi x Deg	124	16	Radial Image
81	30	Hourly Digital Precipitation Array	1/40 LFM	124	256/ 8	Raster Image / Alphanumeric
82	31	Supplemental Precipitation Data	N/A	N/A	N/A	Alphanumeric
83	26	Radar Coded Message (Unedited)	1/16 LFM	248	9	Raster Image/Non-geographic Alpha/ Alphanumeric
84	12	Velocity Azimuth Display	5 Knots	N/A	8	Non-geographic Alphanumeric
85	14	Cross Section Reflectivity	.54 Horizontal x .27 Vert Nmi x Nmi	124	8	Raster Image (Reflectivity)
86	14	Cross Section Velocity	.54 Horizontal x .27 Vert Nmi x Nmi	124	8	Raster Image (Velocity)
87	4	Combined Shear	Adaptable Nmi x Nmi	62	16	Raster Image
88	5	Combined Shear Contour	Adaptable Nmi x Nmi	62	Adap tabl e	Linked Contour Vectors / Set Color / Non-geographic Alpha
89	23	Layer Composite Reflectivity	2.2 x 2.2 Nmi x Nmi	124	8 Avg	Raster Image - Layer 3 Average
90	23	Layer Composite Reflectivity	2.2 x 2.2 Nmi x Nmi	124	8 Max	Raster Image - Layer 3 Maximum
91-92		Reserved for internal PUP and RPG Use				
93-99		Reserved for Future Products				
100		Site Adaptable parameters for VAD Wind Profile (Product 48)				
101		Storm Track Alphanumeric Block				
102		Hail Index Alphanumeric Block				
103		Mesocyclone Alphanumeric Block				
104		TVS Alphanumeric Block				
105		Site Adaptable Parameters for Combined Shear				
106		Site Adaptable Parameters for Combined Shear Contour				
107		Surface Rainfall (1 hr) Alphanumeric Block				
108		Surface Rainfall (3 hr) Alphanumeric Block				

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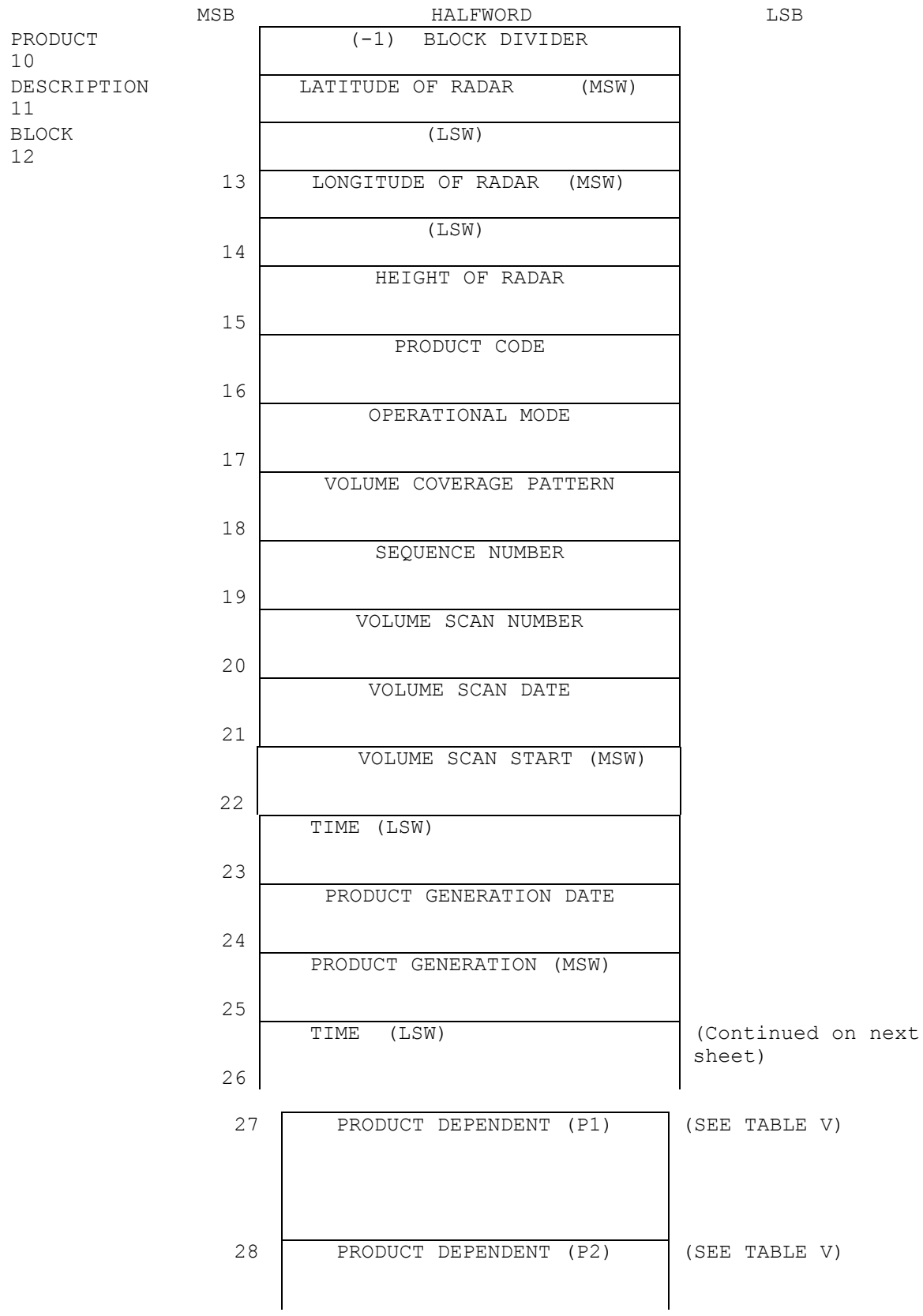
109		Storm Total Accumulation Alphanumeric Block
110-131		Reserved for Future Products

Note: For all message codes for products: Units is N/A, Range is 0 to value shown and Accuracy/Precision is 1.


MSB
HALFWORD
LSB
PRODUCT DESCRIPTION BLOCK
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
(-1) BLOCK DIVIDER
LATITUDE OF RADAR (MSW)
(LSW)
LONGITUDE OF RADAR (MSW)
(LSW)
HEIGHT OF RADAR
PRODUCT CODE
OPERATIONAL MODE
VOLUME COVERAGE PATTERN
SEQUENCE NUMBER
VOLUME SCAN NUMBER
VOLUME SCAN DATE
VOLUME SCAN START (MSW)
TIME (LSW)
PRODUCT GENERATION DATE
PRODUCT GENERATION (MSW)
TIME (LSW)
(Continued on next sheet)
PRODUCT DEPENDENT (P1)
(SEE TABLE V)
PRODUCT DEPENDENT (P2)
(SEE TABLE V)

29	ELEVATION NUMBER	
30	PRODUCT DEPENDENT (P3)	(SEE TABLE V)
31	DATA LEVEL 1 THRESHOLD	(SEE NOTE, SHEET 11)
32	DATA LEVEL 2 THRESHOLD	
33	DATA LEVEL 3 THRESHOLD	
34	DATA LEVEL 4 THRESHOLD	
35	DATA LEVEL 5 THRESHOLD	
36	DATA LEVEL 6 THRESHOLD	
37	DATA LEVEL 7 THRESHOLD	
38	DATA LEVEL 8 THRESHOLD	
39	DATA LEVEL 9 THRESHOLD	
40	DATA LEVEL 10 THRESHOLD	
41	DATA LEVEL 11 THRESHOLD	
42	DATA LEVEL 12 THRESHOLD	
43	DATA LEVEL 13 THRESHOLD	

PRODUCT DESCRIPTION BLOCK	44	DATA LEVEL 14 THRESHOLD	(SEE NOTE, SHEET 11)
	45	DATA LEVEL 15 THRESHOLD	
	46	DATA LEVEL 16 THRESHOLD	
	47	PRODUCT DEPENDENT (P4)	(SEE TABLE V)

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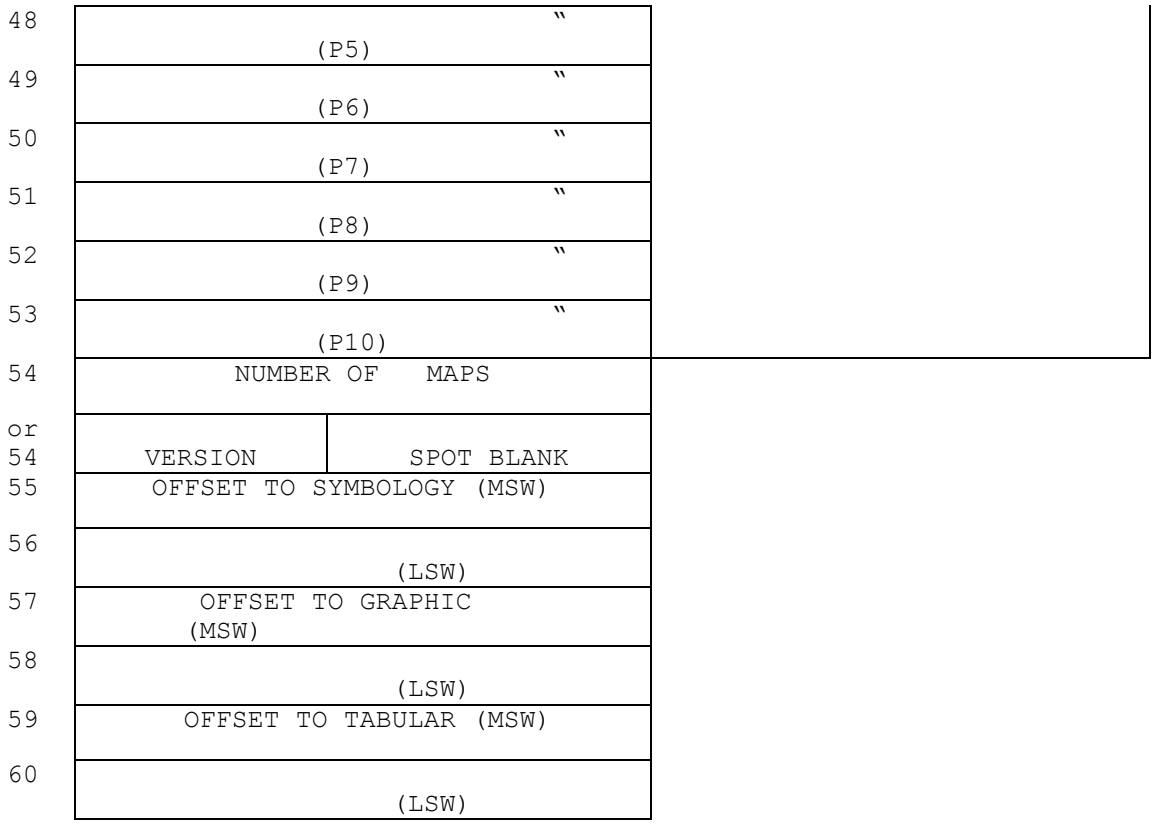
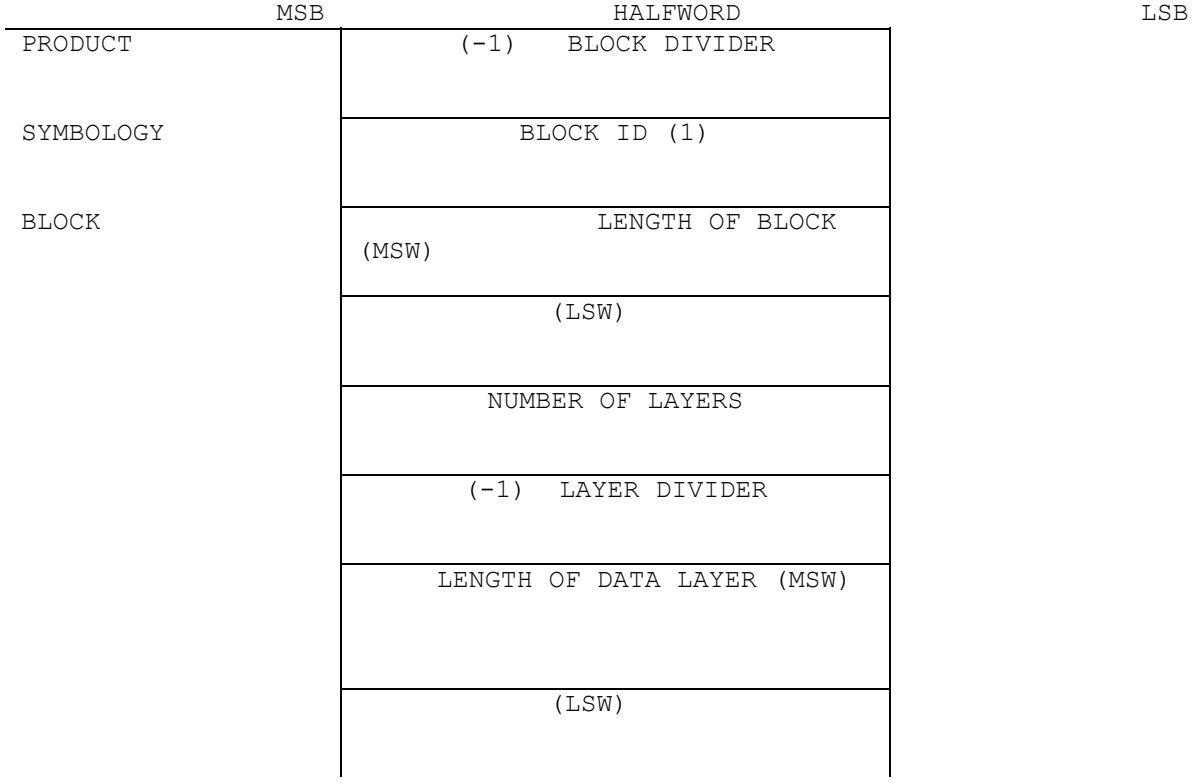
: 16:


48
"
(P5)
49
"
(P6)
50
"
(P7)
51
"
(P8)
52
"
(P9)
53
"
(P10)
54
NUMBER OF MAPS
or
54
VERSION
SPOT BLANK
55
OFFSET TO SYMBOLOGY (MSW)
56
(LSW)
57
OFFSET TO GRAPHIC
(MSW)
58
(LSW)
59
OFFSET TO TABULAR (MSW)
60
(LSW)


MSB
HALFWORD
LSB
PRODUCT
(-1) BLOCK DIVIDER
SYMBOLOGY
BLOCK ID (1)
BLOCK
LENGTH OF BLOCK
(MSW)
(LSW)
NUMBER OF LAYERS
(-1) LAYER DIVIDER
LENGTH OF DATA LAYER (MSW)
(LSW)

:

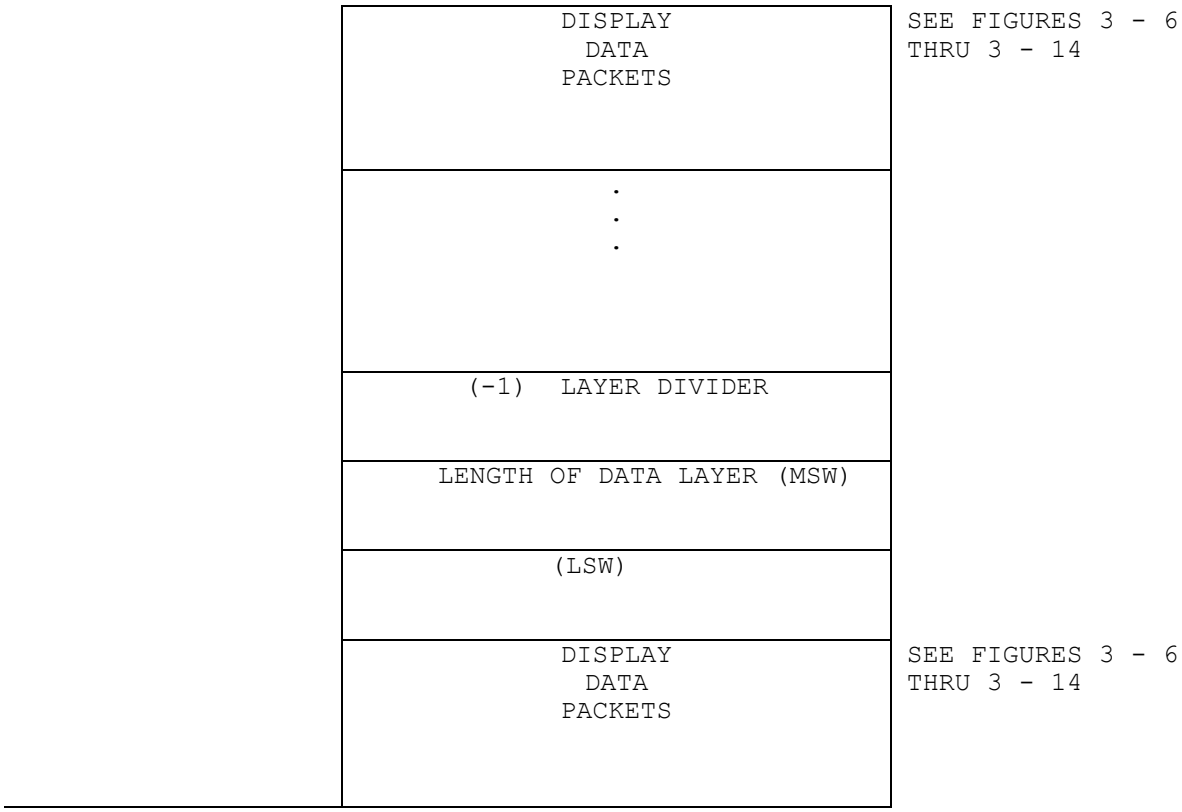


Figure 3-5. Graphic Product Message (Sheet 5 of 13)

MSB HALFWORD LSB

GRAPHIC	BLOCK DIVIDER (-1)
ALPHANUMERIC	BLOCK ID (=2)
BLOCK	LENGTH OF BLOCK (MSW)
	(LSW)
	NUMBER OF PAGES
REPEAT FOR	PAGE NUMBER
EACH PAGE	LENGTH OF PAGE
	TEXT PACKET 1
	. . .
	TEXT PACKET N

MSB HALFWORD LSB

:

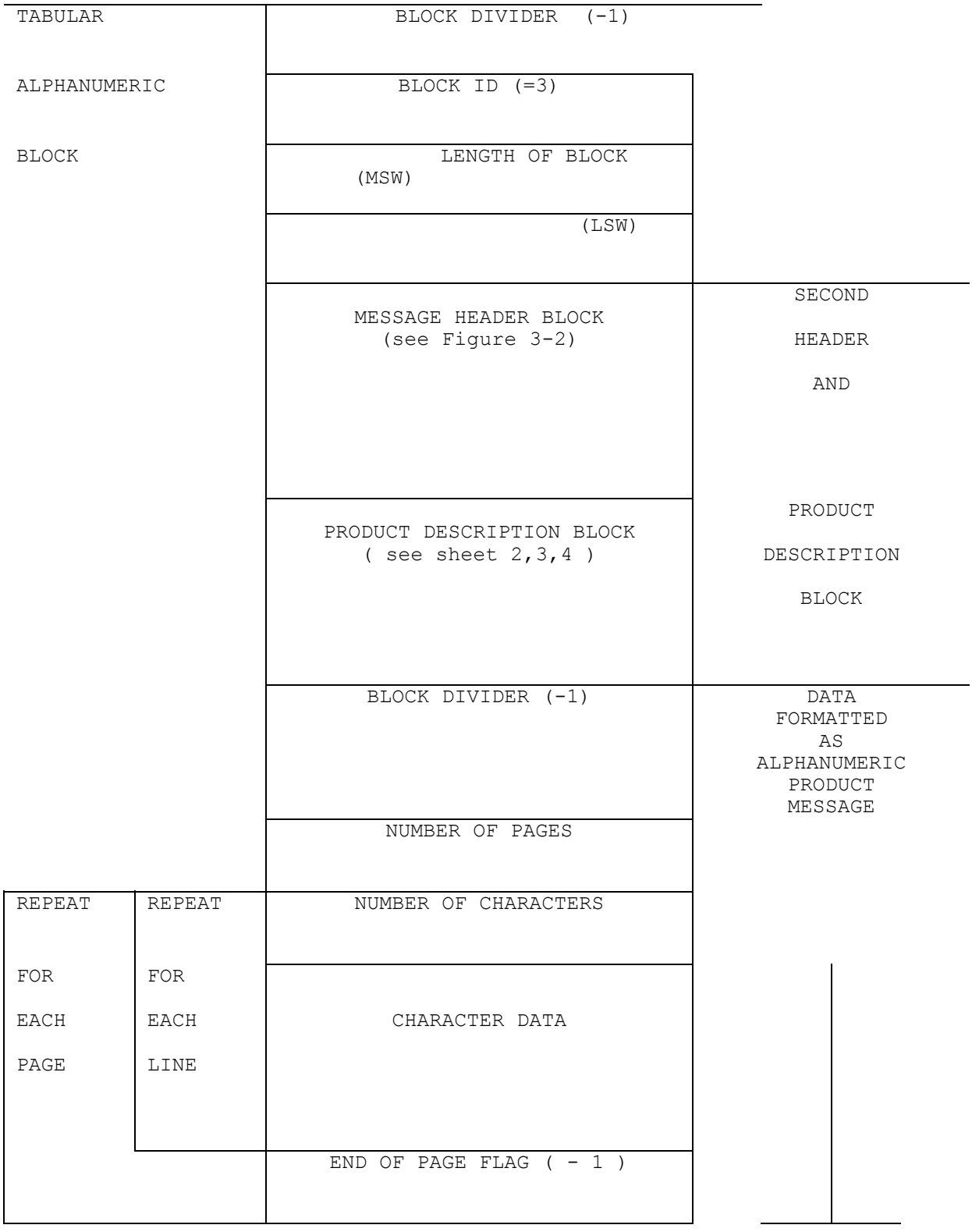


Figure 3-5. Graphic Product Message (Sheet 7 of 13)

PRODUCT DESCRIPTION BLOCK

HALFWORD		TYPE	UNITS	RANGE	PRECISION / ACCURACY	REMARKS
10	Block Divider	INT*2	N/A	-1	N/A	Integer value of -1 used to delineate the header from the Product Description Block
11 - 12	Latitude of Radar	INT*4	Degrees	-90 to +90	0.001	North (+) or South (-) of the Equator
13 - 14	Longitude of Radar	INT*4	Degrees	-180 to +180	0.001	East (+) or West (-) of the Prime Meridian
15	Height of Radar	INT*4	Feet	-100 to +11000	1	Feet above mean sea level
16	Product Code	INT*2	N/A	16 to 131, -16 to -131	N/A	Internal NEXRAD product code of weather product being transmitted (Refer to Table III)
17	Operational Mode	INT*2	N/A	0 to 2	N/A	0 = Maintenance 1 = Clean Air 2 = Precipitation/Severe Weather
18	Volume Coverage Pattern	INT*2	N/A	1 to 767	1	RDA volume coverage pattern for the scan strategy being used
19	Sequence Number	INT*2	N/A	-13, 0 to 32767	1	Sequence number of the request that generated the product (Refer to Figure 3-3). For products generated by an Alert Condition, sequence number = -13
20	Volume Scan Number	INT*2	N/A	1 to 80	1	Counter, recycles to one (1) every 80 volume scans
21	Volume Scan Date	INT*2	Julian Date	1 to 32767	1	Modified Julian Date; integer number of days since 1 Jan 1970
22 - 23	Volume Scan Start Time	INT*4	Seconds GMT	0 to 86399	1	Number of seconds after midnight, Greenwich Mean Time (GMT)
24	Generation Date of Product	INT*2	Julian Date	1 to 32767	1	Modified Julian Date as above

25 - 26	Generation Time of Product	INT*4	Seconds GMT	0 to 86399	1	Number of seconds after midnight, Greenwich Mean Time (GMT)
27 - 28	----------PRODUCT DEPENDENT AS PER TABLE V----------					
29	Elevation Number	INT*2	N/A	1 to 20	1	Elevation number within volume scan
30 - 53	----------PRODUCT DEPENDENT AS PER TABLE V----------					

Figure 3-5. Graphic Product Message (Sheet 8 of 13)

HALFWORD	FIELDNAME					
NOTE: HALFWORD 54 IS DATA DEPENDENT AS FOLLOWS:						
54	Number of Maps	INT*2	N/A	0 to 17	1	If the message is map data, this halfword is the number of Map Pieces
			OR			
54	Version	INT*1	N/A	0 to 255	1	If the message is product data, the upper byte is the version number of the product. The original format of a product will be version 0.
54	Spot Blank	INT*1	N/A	0 to 1	1	If the message is product date, the lower byte is: 1 = Spot Blank ON 2 = Spot Blanking if OFF
55 - 56	Offset to Symbology	INT*4	Halfwords	0 to 80000	1	Number of halfwords from the top of message (message code field in header) to the -1 divider of each block listed. If the offset is zero (0), the block is not part of the product in question
57 - 58	Offset to Graphic	INT*4	Halfwords	0 to 80000	1	Same as above to Graphic Block (NOTE: For Product 62, this will point to the Cell Trend data)
59 - 60	Offset to Tabular	INT*4	Halfwords	0 to 80000	1	Same as above to Tabular Block

Figure 3-5. Graphic Product Message (Sheet 9 of 13)

Note 1. The Data Level threshold values used to define the color table of products, described in Table III, consist of up to 16 Data Levels. The exception to this is products 32, 33 and 81, which may have up to a maximum of 255 equally spaced data levels.

For product 32, data level codes 0 and 1 correspond to "Below Threshold" and "Missing", respectively. Data level codes 2 through 255 denotes data values starting from the minimum data value in even data increments. The threshold level fields are used to describe the 256 levels for product 32 as follows:

halfword 31 contains the minimum data value in dBZ * 10
halfword 32 contains the increment * 10 in dBZ(s).
halfword 33 contains the number of levels (0 - 255)

For product 33, data level code 0 will corresponds to no accumulation and data level code 255 will indicate "Missing". Data level codes 1 through 250 denotes no data values starting from the minimum data value in even data increments. The threshold level fields are used to describe the 256 levels for product 33 as follows:

halfword 31 contains the minimum data value in inch*100
halfword 32 contains the increment*100 inches
halfword 33 contains the number of levels (0 - 255)

For product 81, data level codes 0 will correspond to no accumulation and data level code 255 will represent data outside the coverage area. Data level codes 1 through 254 denotes data values starting from the minimum data value in even data increments. The threshold level fields are used to describe the 256 levels for product 81 as follows:

halfword 31 contains the minimum data value in dBA*10
halfword 32 contains the increment *1000 in dBA(s).
halfword 33 contains the number of levels (0 - 255)

Except for Products 32, 33 and 81, the Data Level Threshold halfwords are coded as follows:

If bit 0 (most significant bit) is set to one (1), then the least significant byte (bits 8-15) is interpreted as a code for:

0 = "BLANK"
1 = TH
2 = ND
3 = RF

If bits 2, 3, 4, 5, 6 or 7 of the most significant byte are set to 1, then they are interpreted as a code for:

Bit 2 - If set the data field in the least significant byte is scaled by 20, to allow two decimal places of accuracy in some of the Threshold tables.

Bit 3 - If set the data field in the least significant byte is scaled by 10, to allow for one decimal place of accuracy in some of the threshold tables.

Bit 4 = ">"
Bit 5 = "<"
Bit 6 = "+"
Bit 7 = "-"

If bit 0 (most significant bit) is zero (0), then the low order byte (bits 8 - 15) is a numeric value.

Example: A data level value of (Hex) 8401, (bit sequence 1000 0100 0000 0001) is interpreted as: < TH

Figure 3-5. Graphic Product Message (Sheet (page) 10 of 13)

PRODUCT SYMBOLOGY BLOCK

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Block Divider	INT*2	N/A	-1	N/A	Integer value of -1 used to delineate the Product Description from the Product Symbology Block
Block ID	INT*2	N/A	1	N/A	Constant value of 1 which identifies this block
Length of Block	INT*4	N/A	1 to 80000	1	Length of block in bytes (includes preceding divider and block id)
Number of Layers	INT*2	N/A	1 to 15	1	Number of data layers contained in this block (see Note 2)
Layer Divider	INT*2	N/A	-1	N/A	Integer value of -1 used to delineate one data layer from another
Length of Data Layer	INT*4	N/A	1 to 80000	1	Length of data layer (in bytes) not including layer divider and length field
Display Data Packets	N/A	N/A	N/A	N/A	See Figures 3-6 through 3-14

Note 2. The various layers are different types of data formats. An example would be the combined moment product. One layer is reflectivity data in radial packets, another layer is the vector arrow packets that define the velocity and spectrum width. The length of the layer does not include the divider or the length word.

Figure 3-5. Graphic Product Message (Sheet 11 of 13)

GRAPHIC ALPHANUMERIC BLOCK

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Block Divider	INT*2	N/A	-1	N/A	Integer value of -1 used to delineate the Graphic Alphanumeric Block
Block ID	INT*2	N/A	2	N/A	Constant value of 2 which identifies this block
Length of Block	INT*4	N/A	1 to 65535	1	Length of block in bytes (includes preceding divider and block id) from the divider to the end of message
Number of Pages	INT*2	N/A	1 to 48	1	Total number of pages
Page Number	INT*2	N/A	1 to 48	1	Current page number
Length of Page	INT*2	N/A	4 to 1360	1	Number of bytes in Text Packet 1 through Text Packet N
Text Packet (N)	N/A	N/A	N/A	N/A	The format of these text packets are Packet Code 8, shown in Figure 3-8, and Packet Code 10, shown in Figure 3-7

Figure 3-5. Graphic Product Message (Sheet 12 of 13)

TABULAR ALPHANUMERIC BLOCK (see note 3)

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Block Divider	INT*2	N/A	-1	N/A	Integer value of -1 used to delineate the Tabular Alphanumeric Block
Block ID	INT*2	N/A	3	N/A	Constant value of 3 which identifies this block
Length of Block	INT*4	N/A	1 to 65535	1	Length of block in bytes from the divider to the end of message
----------SECOND MESSAGE HEADER BLOCK----------					
----------SECOND PRODUCT DESCRIPTION BLOCK----------					
Block Divider	INT*2	N/A	-1	N/A	Integer value of -1 used to delineate the data from the Product Description Block
Number of Pages	INT*2	N/A	1 to 48	1	Total number of pages
Number of Characters	INT*2	N/A	0 to 1360	1	Number of characters in page
Character Data	CHAR	8 Bit ASCII	ASCII Character Set	N/A	Characters are ASCII when the MSB is set to zero. When the MSB is set to one, the remaining 7 bits define the special symbol
End of Page Flag	INT*2	N/A	-1	N/A	Integer value of -1 to delineate the end of page

NOTE 3. Tabular Alphanumeric Block must be the last block in a product message. Maximum lines per page = 17. Alphanumeric Products containing RPG Site Adaptable Parameters must have the Site Adaptable Parameters formatted as the last page(s) of the Product.

Figure 3-5. Graphic Product Message (Sheet 13 of 13)

Table V. Product Dependent Halfword Definition for Product Description Block

Product Name	Msg Code	Hword#	Content	Units	Range	Accur/Prec
Base Reflectivity	16-21	30	Elevation Angle	Degree	-1.0 to +45.0	.1
Base Reflectivity	16-21	47	Max Reflectivity	dBZ	-32 to +95, (-33)	1, Note 6
Base Reflectivity	16-21	51	Cal. Constant (MSB)			
Base Reflectivity	16-21	52	" " (LSB)	dB (Real*4)	-50.0 to +50.0	N/A, Note 2
Base Spectrum Width	28-30	30	Elevation Angle	Degree	-1.0 to +45.0	.1, Note 1
Base Spectrum Width	28-30	47	Max Spectrum Width	Knots	0 to 19	1
Base Velocity	22-27	30	Elevation Angle	Degree	-1.0 to +45.0	.1, Note 1
Base Velocity	22-27	47	Max Neg. Velocity	Knots	-247 to 0	1
Base Velocity	22-27	48	Max Pos. Velocity	Knots	0 to 245	1
Clutter Filter Control	34	27	Channel/ Segment Bit Map	N/A	0,1 Bit	N/A , Note 8
Clutter Filter Control	34	48	Bypass Map Date	Julian Date	1 to 32767	1
Clutter Filter Control	34	49	Bypass Map Time	Minutes	0 to 1439	1
Clutter Filter Control	34	50	Notchwidth Map Date	Julian Date	1 to 32767	1
Clutter Filter Control	34	51	Notchwidth Map Time	Minutes	0 to 1439	1
Combined Moment	49	27	Azimuth of Window	Degree	0.0 to 359.9	.1, Note 1
Combined Moment	49	28	Range of Window	Nmi	0.0 to 124.0	.1, Note 1
Combined Moment	49	30	Elevation Angle	Degree	-1.0 to +45.0	.1, Note 1
Combined Moment	49	47	Max dBZ	dBZ	-32 to +95	1
Combined Moment	49	48	Max Neg. Velocity	Knots	-247 to 0	1
Combined Moment	49	49	Max Pos. Velocity	Knots	0 to +245	1
Combined Moment	49	50	Max Spectrum Width	Knots	0 to 19	1
Combined Shear Contour	88	30	Elevation Angle	Degree	-1.0 to +45.0	.1, Note 1
Combined Shear Contour	88	47	Max Shear Value	E-3/Second	0 to 32767	1
Combined Shear Contour	88	48	Az. of Max Shear	Degree	0.0 to 359.9	.1, Note 1
Combined Shear Contour	88	49	Range of Max	Nmi	0.0 to 124.0	.1, Note 1
Combined Shear Contour	88	50	Resolution	Nmi	.27, .54,1.1, 2.2	.01, Note 1

Combined Shear Product	87	30	Elevation Angle	Degree	-1.0 to +45.0	.1, Note 1
Combined Shear Product	87	47	Max Shear Value	E-3/Sec.	0 to 32767	1
Combined Shear Product	87	48	Az. of Max Shear	Degree	0.0 to 359.9	.1, Note 1
Combined Shear Product	87	49	Range of Max	Nmi	0.0 to 124.0	.1, Note 1
Combined Shear Product	87	50	Resolution	Nmi	.27,.54,1.1 ,2.2	.01, Note 1
Comp. Reflect. Contour	39 - 40	47	Max Reflectivity	dBZ	-32 to +95	1
Comp. Reflect. Contour	39 - 40	51	Cal Constant (MSB)			
Comp. Reflect. Contour	39 - 40	52	" " (LSB)	dB (Real*4)	-50 to +50	N/A, Note 2
Comp. Reflect. Contour	39 - 40	53	Contour Interval	dBZ	5 to 25	5/1
Composite Reflectivity	35 - 38	47	Max Reflectivity	dBZ	-32 to +95, (-33)	1, Note 6
Composite Reflectivity	35 - 38	51	Cal. Constant (MSB)			
Composite Reflectivity	35 - 38	52	" " (LSB)	dB (Real*4)	-50 to +50	N/A, Note 2
Cross Section (SW)	52	47	Azimuth point one	Degree	0.0 to 359.9	.1, Note 1
Cross Section (SW)	52	48	Range point one	Nmi	0.0 to 124.0	.1, Note 1
Cross Section (SW)	52	49	Azimuth point two	Degree	0.0 to 359.0	.1, Note 1
Cross Section (SW)	52	50	Range point two	Nmi	0.0 to 124.0	.1, Note 1
Cross Section (Vel)	51 & 86	47	Azimuth point one	Degree	0.0 to 359.9	.1, Note 1
Cross Section (Vel)	51 & 86	48	Range point one	Nmi	0.0 to 124.0	.1, Note 1
Cross Section (Vel)	51 & 86	49	Azimuth point two	Degree	0,0 to 359.9	.1, Note 1
Cross Section (Vel)	51 & 86	50	Range point two	Nmi	0.0 to 359.9	.1, Note 1
Cross Section (Reflect)	50 & 85	47	Azimuth point one	Degree	0.0 to 359.9	.1, Note 1
Cross Section (Reflect)	50 & 85	48	Range point one	Nmi	0.0 to 124.0	.1, Note 1
Cross Section (Reflect)	50 & 85	49	Azimuth point two	Degree	0.0 TO 359.9	.1, Note 1
Cross Section (Reflect)	50 & 85	50	Range point two	Nmi	0.0 to 124.0	.1, Note 1
Cross Section (Reflect)	50 & 85	51	Cal. Constant (MSB)			
Cross Section (Reflect)	50 & 85	52	" " (LSB)	dB (Real*4)	-50.0 to+50.0	N/A, Note 2
Digital Hybrid Scan Reflect	32	47	Max Reflectivity	dBZ	-32 to +95, (-33)	1, Note 6
Digital Hybrid Scan Reflect	32	48	Date of Scan	Julian Date	1 to 32767	1
Digital Hybrid Scan Reflect	32	49	Avg. Time of Hybrid Scan	Minutes	0 to 1439	1

Digital Hybrid Scan Reflect	32	51	Cal. Const. (MSB)			
Digital Hybrid Scan Reflect	32	52	Cal. Const. (LSB)	dB (Real*4)	-50.0 to +50.0	N/A, Note 2
Digital Storm Total Precip	33	47	Max Rainfall	Inches	0.0 to 327.6	.1, Note 1
Digital Storm Total Precip	33	48	Beg. Date Rainfall	Julian Date	1 to 32767	1
Digital Storm Total Precip	33	49	Beg. Time Rainfall	Minutes	0 to 1439	1
Digital Storm Total Precip	33	50	End Date Rainfall	Julian Date	1 to 32767	1
Digital Storm Total Precip	33	51	End Time Rainfall	Minutes	0 to 1439	1
Digital Storm Total Precip	33	52	Rate Bias	N/A	0.0 to 99.99	.01, Note 1
Digital Storm Total Precip	33	53	Error Var. Of Bias	N/A	0.0 to 99.99	.01, Note 1
Echo Tops Product	41	47	Max Echo	1000 Feet	0 to 70	1, Note 5
Echo Tops Contour	42	47	Max Echo	1000 Feet	0 to 70	1, Note 5

Table V. Product Dependent Halfword Definition for Product Description Block

Product Name	Msg Code	Hword #	Content	Unit	Range	Accur/Prec
Echo Tops Contour	42	53	Contour Interval	Feet	2000 to 30000	1000/1, Note 5
Free Text Message	75	47	RPG ID Number	N/A	0 to 999	1
Hail Index	59	--	--	--	--	--
Hourly Dig.Precip Array	81	47	Max Rainfall Accum.	dBA	0.0 to 32.0	.1, Note 1
Hourly Dig. Precip Array	81	48	Rate Bias	N/A	0.0 to 99.99	.01, Note 1
Hourly Dig. Precip Array	81	49	Err Var. of Bias	N/A	0.0 to 99.99	.01, Note 1
Hourly Dig. Precip Array	81	50	Rainfall End Date	Julian Date	1 to 32767	1
Hourly Dig. Precip Array	81	51	Rainfall End Time	Minutes	0 to 1439	1
Lyr 1 Comp.Reflect (avg)	63	47	Max Reflectivity	dBZ	-32 to +95	1
Lyr 1 Comp.Reflect (avg)	63	48	Bottom of layer	1000 Feet	0	Note 5
Lyr 1 Comp.Reflect(avg)	63	49	Top of layer	Feet	6000 to 58000	1
Lyr 1 Comp.Reflect(avg)	63	51	Cal. Constant (MSB)			

Lyr 1 Comp.Reflect(avg)	63	52	" " (LSB)	dB (Real*4)	-50.0 to +50.0	N/A, Note 2
Lyr 1 Comp.Reflect(max)	65	47	Max Reflectivity	dBZ	-32 to +95	1
Lyr 1 Comp.Reflect(max)	65	48	Bottom of layer	1000 Feet	0	Note 5
Lyr 1 Comp.Reflect(max)	65	49	Top of layer	1000 Feet	6 to 58	1
Lyr 1 Comp.Reflect(max)	65	51	Cal. Constant (MSB)			
Lyr 1 Comp.Reflect(max)	65	62	" " (LSB)	dB (Real*4)	-50.0 to +50.0	N/A, Note 2
Lyr 1 Comp.Turb. (avg)	67	47	Max Turbulence	CM E2/3/S	0.0 -25.0, (-0.2)	.1, Note 1 & 6
Lyr 1 Comp.Turb.(avg)	67	48	Bottom of layer	1000 Feet	0	Note 5
Lyr 1 Comp. Turb. (avg)	67	49	Top of Layer	1000 Feet	6 to 70	1
Lyr 1 Comp.Turb. (max)	70	47	Max Turbulence	CM E2/3/S	0.0-25.0, (-0.2)	.1, Note 1 & 6
Lyr 1 Comp.Turb. (max)	70	48	Bottom of layer	1000 Feet	0	Note 5
Lyr 1 Comp.Turb. (max)	70	49	Top of layer	1000 Feet	6 to 58	1
Lyr 2 Comp.Reflect(avg)	64	47	Max Reflectivity	dBZ	-32 to +95	1
Lyr 2 Comp.Reflect(avg)	64	48	Bottom of layer	1000 Feet	6 to 58	1
Lyr 2 Comp.Reflect(avg)	64	49	Top of layer	1000 Feet	12 to 64	1
Lyr 2 Comp.Reflect(avg)	64	51	Cal. Constant (MSB)			
Lyr 2 Comp.Reflect(avg)	64	52	" " (LSB)	dB (Real*4)	-50.0 to +50.0	N/A, Note 2
Lyr 2 Comp.Reflect(max)	66	47	Max Reflectivity	dBZ	-32 to +95	1
Lyr 2 Comp.Reflect(max)	66	48	Bottom of layer	1000 Feet	6 to 58	1
Lyr 2 Comp.Reflect(max)	66	49	Top of layer	1000 Feet	12 to 64	1
Lyr 2 Comp.Reflect(max)	66	51	Cal. Constant (MSB)			
Lyr 2 Comp.Reflect(max)	66	52	" " (LSB)	dB (Real*4)	-50.0 to +50.0	N/A, Note 2
Lyr 2 Comp.Turb. (avg)	68	47	Max Turbulence	CM E2/3/S	0.0-25.0, (-0.2)	.1, Note 1 & 6
Lyr 2 Comp.Turb. (avg)	68	48	Bottom of layer	1000 Feet	6 to 58	1
Lyr 2 Comp.Turb. (avg)	68	49	Top of layer	1000 Feet	12 to 64	1
Lyr 2 Comp.Turb. (max)	71	47	Max Turbulence	CM E2/3/S	0.0-25.0, (-0.2)	.1, Note 1 & 6
Lyr 2 Comp.Turb. (max)	71	48	Bottom of layer	1000 Feet	6 to 58	1
Lyr 2 Comp.Turb. (max)	71	49	Top of layer	1000 Feet	12 to 64	1
Lyr 3 Comp.Reflect (avg)	89	47	Max Reflectivity	dBZ	-32 to +95	1

Lyr 3 Comp.Reflect (avg)	89	48	Bottom of layer	1000 Feet	12 to 64	1
Lyr 3 Comp.Reflect (avg)	89	49	Top of layer	1000 Feet	18 to 70	1
Lyr 3 Comp.Reflect (avg)	89	51	Cal. Constant (MSB)			
Lyr 3 Comp.Reflect (avg)	89	52	" " (LSB)	dB (Real*4)	-50.0 to +50.0	N/A, Note 2
Lyr 3 Comp.Reflect (max)	90	47	Max Reflectivity	dBZ	-32 to +95	1
Lyr 3 Comp.Reflect (max)	90	48	Bottom of layer	1000 Feet	12 to 64	1
Lyr 3 Comp.Reflect (max)	90	49	Top of layer	1000 Feet	18 to 70	1
Lyr 3 Comp.Reflect (max)	90	51	Cal. Constant (MSB)			

TABLE V. Product Dependent Halfword Definition for Product Description Block

Product Name	Msg Code	Hword #	Content	Units	Range	Accur/Prec
Lyr 3 Comp.Reflect (max)	90	52	Cal. Constant (LSB)	dB (Real*4)	-50.0 to +50.0	N/A, Note 2
Lyr 3 Comp.Turb. (avg)	69	47	Max Turbulence	CM E2/3/S	0.0-25.0, (-0.2)	.1, Note 1 & 6
Lyr 3 Comp.Turb. (avg)	69	48	Bottom of layer	1000 Feet	12 to 64	1
Lyr 3 Comp.Turb. (avg)	69	49	Top of layer	1000 Feet	18 to 70	1
Lyr 3 Comp.Turb. (max)	72	47	Max Turbulence	CM E2/3/S	0.0-25.0, (-0.2)	.1, Note 1 & 6
Lyr 3 Comp.Turb. (max)	72	48	Bottom of layer	1000 Feet	12 to 64	1
Lyr 3 Comp.Turb. (max)	72	49	Top of layer	1000 Feet	18 to 70	1
Mesocyclone	60	--	--	---		
PUP Text Message	77	47	PUP ID Number	N/A	0 to 32767	1
PUP Text Message	77	49	User Designation	N/A	0 to 47	1, Note 5
Radar Coded Message	74 & 83	49	Edit Decision Time	Seconds	60 to 540	60/1
Radar Coded Message	74 & 83	50	Editing Timeout	Seconds	60 to 1800	60/1
Radar Coded Message	74	51	Edited Indicator	N/A	Not 0 for edited	N/A
Severe Weather Prob.	47	47	Max %	Percent	0 to 99	1
Severe Weather Prob.	47	48	Max SWP Box Size	Nmi	6.5 to 54.0	.1, Note 1
Severe Weather (Reflect)	43	27	Azimuth of Window	Degree	0.0 to 359.9	.1, Note 1
Severe Weather (Reflect)	43	28	Range of Window	Nmi	0.0 to 124.0	.1, Note 1
Severe Weather (Reflect)	43	30	Elevation Angle	Degree	-1.0 to +45.0	.1, Note 1
Severe Weather (Reflect)	43	47	Max Reflectivity	dBZ	-32 to 95, (-999)	1, Note 6
Severe Weather (Reflect)	43	49	Height of Phenomena	1000 Ft AGL	0 to 70	1
Severe Weather (Reflect)	43	51	Alert Category	N/A	See Table IV	1, Note 7
Severe Weather (Shear)	46	27	Azimuth of Window	Degree	0.0 to 359.9	.1, Note 1
Severe Weather (Shear)	46	28	Range of Window	Nmi	0.0 to 124.0	.1, Note 1

Severe Weather (Shear)	46	30	Elevation Angle	Degree	-1.0 to +45.0	.1, Note 1
Severe Weather (Shear)	46	47	Max Negative Shear	E-3/Sec	-500 to 0	1
Severe Weather (Shear)	46	48	Max Positive Shear	E-3/Sec	0 to 500	1
Severe Weather (Shear)	46	49	Height of Phenomena	1000 Ft AGL	0 to 70	1
Severe Weather (Shear)	46	51	Alert Category	N/A	See Table IV	1, Note 7
Severe Wea. (Spect. Wd)	45	27	Azimuth of Window	Degree	0.0 to 359.9	.1, Note 1
Severe Wea. (Spect. Wd)	45	28	Range of Window	Nmi	0.0 to 124.0	.1, Note 1
Severe Wea. (Spect. Wd)	45	30	Elevation Angle	Degree	01.0 to +45.0	.1, Note 1
Severe Wea. (Spect. Wd)	45	47	Max Spectrum Width	Knots	0 to 19, (-1942)	1, Note 6
Severe Wea. (Spect. Wd)	45	49	Height of Phenomena	1000 Ft AGL	0 to 70	1
Severe Wea. (Spect. Wd)	45	51	Alert Category	N/A	See Table IV	1, Note 7
Severe Wea. (Velocity)	44	27	Azimuth of Window	Degree	0.0 to 359.9	.1, Note 1
Severe Wea. (Velocity)	44	28	Range of Window	Nmi	0.0 to 124.0	.1, Note 1
Severe Wea. (Velocity)	44	30	Elevation Angle	Degree	-1.0 to +45.0	.1, Note 1
Severe Wea. (Velocity)	44	47	Max Neg. Velocity	Knots	-247 to 0	1
Severe Wea. (Velocity)	44	48	Max Pos. Velocity	Knots	0 to +245	1
Severe Wea. (Velocity)	44	49	Height of Phenomena	1000 Ft AGL	0 to 70	1
Severe Wea. (Velocity)	44	51	Alert Category	N/A	See Table IV	1, Note 7
Storm Mean Radial Vel.	55	27	Azimuth of Window	Degree	0.0 to 359.9	.1, Note 1
Storm Mean Radial Vel.	55	28	Range of Window	Nmi	0.0 to 124.0	.1, Note 1
Storm Mean Radial Vel.	55	30	Elevation Angle	Degree	-1.0 to +45.0	.1, Note 1
Storm Mean Radial Vel.	55	47	Max Neg. Velocity	Knots	-247 to 0	1
Storm Mean Radial Vel.	55	48	Max Pos. Velocity	Knots	0 to +245	1
Storm Mean Radial Vel.	55	49	Motion Source Flag	N/A	-1 = Algorithm	1
Storm Mean Radial Vel.	55	50	Height of Phenomena	1000 Ft AGL	0 to 70	1
Storm Mean Radial Vel.	55	51	Storm Speed	Knots	0.0 to 99.9	.1, Note 1
Storm Mean Radial Vel.	55	52	Storm Direction	Degree	0.0 to 359.9	.1, Note 1
Storm Mean Radial Vel.	55	53	Alert Category	N/A	See Table IV	1, Note 7
Storm Mean Radial Vel.	56	30	Elevation Angle	Degree	-1.0 to +45.0	.1, Note 1

Storm Mean Radial Vel.	56	47	Max Neg. Velocity	Knots	-247 to 0	1
Storm Mean Radial Vel.	56	48	Max Pos. Velocity	Knots	0 to +245	1
Storm Mean Radial Vel.	56	49	Motion Source Flag	N/A	-1 = Algorithm	1
Storm Mean Radial Vel.	56	51	Avg Speed of Storms	Knots	0.0 to 99.9	.1, Note 1
Storm Mean Radial Vel.	56	52	Avg Dir. of Storms	Degree	0.0 to 359.9	.1, Note 1
Storm Structure	62	--	--	--		
Storm Total Accum.	80	47	Max Rainfall	Inches	0.0 to 327.6	.1, Note 1
Storm Total Accum.	80	48	Beg. Date Rainfall	Julian Date	1 to 32767	1
Storm Total Accum.	80	49	Beg. Time Rainfall	Minutes	0 to 1439	1
Product Name	Msg Code	Hword #	Content	Unit	Range	Accur/Prec
Storm Total Accum.	80	50	End Date Rainfall	Julian date	1 to 32767	1
Storm Total Accum.	80	51	End Time Rainfall	Minutes	0 to 1439	1
Storm Total Accum.	80	52	Rate Bias	N/A	0.0 to 99.99	.01, Note 1
Storm Total Accum.	80	53	Error Var. of Bias	N/A	0.0 to 99.99	.01, Note 1
Storm Track	58	47	Total Number of Storms	N/A	0 to 20%	1
Supplemental Prec. Data	82	47	Max Rainfall	Inches/hour	0.0 to 63.0	.1, Note 1
Surface Rainfall Accum	78 & 79	47	Max Rainfall	Inches	0.0 to 189.0	.1, Note 1
Surface Rainfall Accum	78 & 79	48	Rate Bias	N/A	0.0 to 99.99	.01, Note 1
Surface Rainfall Accum	78 & 79	49	Err. Var. of Bias	N/A	0.0 to 99.99	.01, Note 1
Surface Rainfall Accum	78 & 79	50	Rainfall End Date	Julian Date	1 to 32767	1
Surface Rainfall Accum	78 & 79	51	Rainfall End Time	Minutes	0 to 1439	1
TVS	61	--	--	--		
User Alert Message	73	--	--	--		
User Selectable Precip.	31	27	End Hour	Hours	0 to 23	1
User Selectable Precip.	31	28	Time Span	Hours	1 to 24	1
User Selectable Precip.	31	30	Null Product Flag	N/A	0 ro 1	1, Note 9
User Selectable Precip.	31	47	Max Rainfall	Inches	0.0 to 327.6	.1, Note 1
User Selectable Precip.	31	48	Beg. Date Rainfall	Julian Date	1 to 32767	1
User Selectable Precip.	31	49	Beg. Time Rainfall	Minutes	0 to 1439	1
User Selectable	31	50	End Date	Julian Date	1 to 32767	1

Precip.			Rainfall			
User Selectable Precip.	31	51	End Time Rainfall	Minutes	0 to 1439	1
User Selectable Precip.	31	52	Average Rate Bias	N/A	0.0 to 99.99	.01, Note 1
User Selectable Precip.	31	53	Average Error Var. Of Bias	N/A	0.0 to 99.99	.01, Note 1
Velocity Az. Display	84	47	Wind Speed (Horiz)	Knots	0 to 350	1, Note 5
Velocity Az. Display	84	48	Wind Direct(Horiz)	Degree	0 to 359	1, Note 1 & 5
Velocity Az. Display	84	30	Wind Alt (Horiz)	1000 Feet	0 to 70	1
Velocity Az. Display	84	49	Elevation Angle	Degree	-1.0 to +45.0	.1, Note 1 & 5
Velocity Az. Display	84	50	Slant Range	Nmi	0.0 to 124.0	.1, Note 1 & 5
Velocity Az. Display	84	51	RMS Error	Knots	0 to 29	1, Note 5
VAD Wind Profile	48	47	Max Speed (Horiz)	Knots	0 to 350	1, Note 5
VAD Wind Profile	48	48	Direct of Max Speed	Degree	0 to 359	1, Note 1 & 5
VAD Wind Profile	48	49	Alt of Max Speed	Feet/10	00.00 to 70.00	.01, Note 5
Vertically Integ. Liq	57	47	Max VIL	Kg/Sq. meter	0 to 200	1
Weak Echo Region	53	27	Azimuth of Window	Degree	0.0 to 359.9	.1, Note 1
Weak Echo Region	53	28	Range of Window	Nmi	0.0 to 124.0	.1, Note 1
Weak Echo Region	53	47	Max Reflectivity	dBZ	-32 to 95(-999)	1, Note 6
Weak Echo Region	53	48	Storm ID	Alphanumeric	01-09,A-Z,10-99	N/A, ASCII
Weak Echo Region	53	49	Elevations (MSB)	Bit Map	0,1	N/A, Note 3
Weak Echo Region	53	50	Elevations (LSB)	Bit Map	0,1	N/A, Note 4

Table V. Product Dependent Halfword Definition for Product Description Block

Note 1. Scaled Integer, precision column defines scaling.

Note 2. Real*4 represents one fullword (32 bits) of real data, where the MSB is the sign bit, followed by a 7 bit exponent and a 24 bit mantissa.

Note 3. Corresponds to MSB of bit map as defined in Table II-A.

Note 4. Corresponds to LSB of bit map as defined in Table II-A.

Note 5.

	Msg Code	Halfword	Description
		Echo Tops Product	41 47 Value of zero altitude indicates "No
		Echo Tops Contour	42 47 Echos Detected"
PUP Text Message	77	49	User designation is set by the RPGOP only, where: 0 = Send message to all dedicated users; >0 = Send message to the user on specific line identified.
		Layer Products	63-72 48 Value of zero layer bottom indicates
	89-90	48	"Surface"
VAD Wind Profile	48	49	Altitude value of -9999 indicates ("Wind Barbs") non-valid altitude, speed and direction which are displayed as blanks
Velocity Azimuth	84	47	Wind speed value of -9999 Display indicates non-valid speed and direction. Speed and direction are displayed as blanks

50 Slant range value of -9999 indicates non-valid slant range and elevation angle. Values of slant range and elevation angle are displayed as blanks

51 RMS value of -9999 indicates non-valid RMS. Value of RMS is displayed as blanks.

Note 6. Value enclosed in parentheses of range column is a code to indicate data is unavailable.

Note 7. Applicable only to products generated as a result of an Alert.

Note 8. Defines the clutter map channel type and segment number. Bit 15 (LSB) defines the channel type. If bit 15 is 0, then it is a clutter filter control product for the surveillance channel. If bit 15 is 1, then it is the Doppler channel clutter filter control product. Bits 14 through 10 specify elevation segment numbers 1 through 5, respectively. Segment 1 is the lowest elevation clutter filter map, segment 2 is the upper elevation clutter filter map. Segments 3 through 5 are for future expansion.

Note 9. If flag is set, the product is null i.e., rainfall data to build product was unavailable.

HALFWORD

MSB No Value

LSB

	PACKET CODE (=6)	
	LENGTH OF DATA BLOCK (BYTES)	
DATA BLOCK	I STARTING POINT	1/4 Km or Screen Coordinates
	J STARING POINT	
	END I VECTOR NUMBER 1	
	END J VECTOR NUMBER 1	
	END I VECTOR NUMBER 2	
	END J VECTOR NUMBER 2	
	.	
	.	

Figure 3-6. Linked Vector Packet (Sheet 1 of 4)

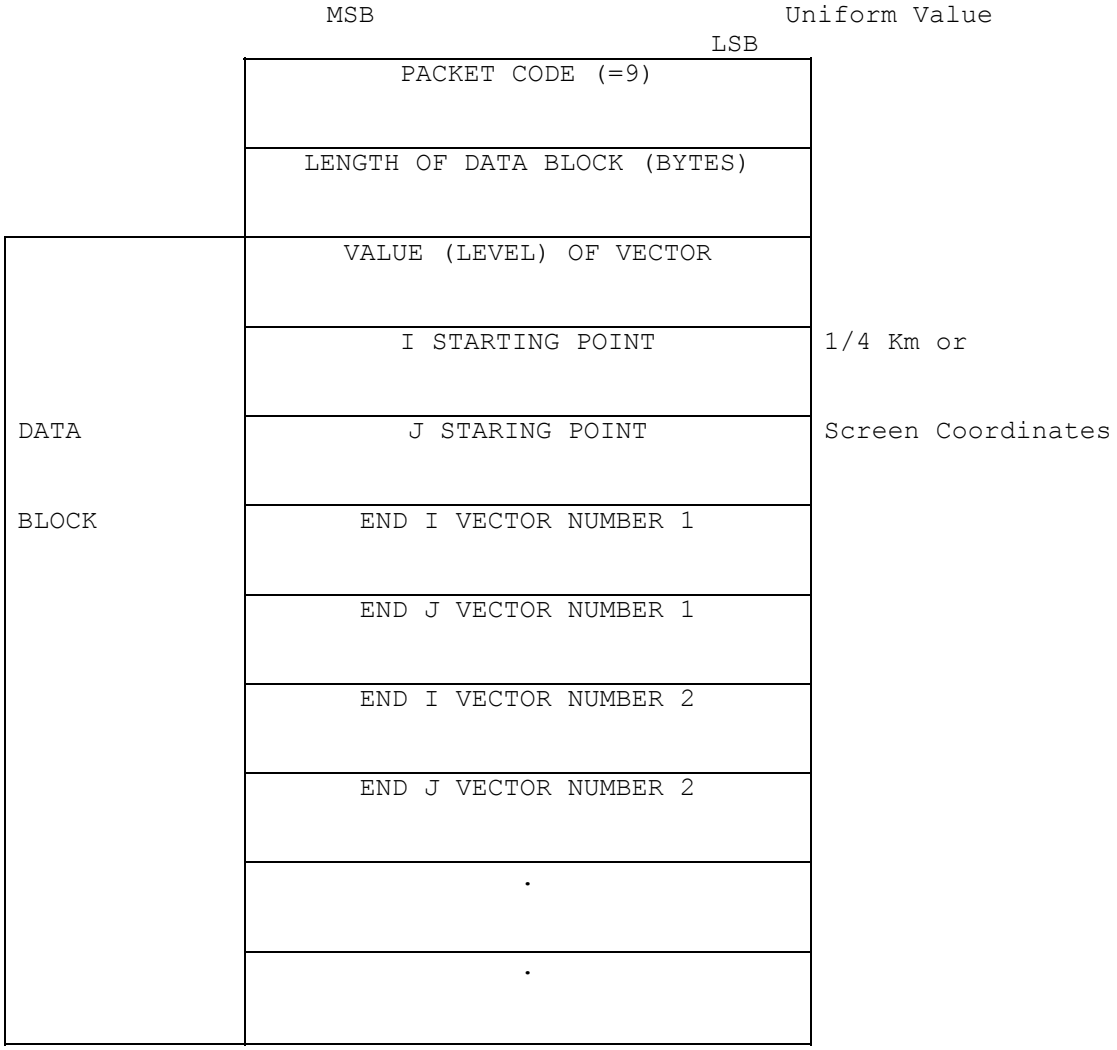


Figure 3-6. Linked Vector Packet (Sheet 2 of 4)

No Value

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	6	N/A	Packet Type 6
Length of Block	INT*2	N/A	1 to 32767	1	Number of bytes in block not including self or packet code
I Starting Point	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector starting point
J Starting Point	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector starting point
End I Vector Number 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector end point 1
End J Vector Number 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector end point 1
End I Vector Number 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector end point 2
End J Vector Number 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector end point 2

Figure 3-6. Linked Vector Packet (Sheet 3 of 4)

Uniform Value

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	9	N/A	Packet Type 9
Length of Block	INT*2	N/A	1 to 32767	1	Number of bytes in block not including self or packet code
Value (Level) of Vector	INT*2	N/A	0 to 15	1	Color Level of Vector
I Starting Point	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector starting point
J Starting Point	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector starting point
End I Vector Number 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector end point 1
End J Vector Number 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector end point 1
End I Vector Number 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector end point 2
End J Vector Number 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector end point 2

Figure 3-6. Linked Vector Packet (Sheet 4 of 4)

	HALFWORD		
	MSB	No Value	LSB
	PACKET CODE(=7)		
	LENGTH OF DATA BLOCK(BYTES)		
	BEGINNING I VECTOR 1		1/4 KM
	BEGINNING J VECTOR 1		OR
DATA	END I	VECTOR 1	SCREEN COORDINATES
BLOCK	END J	VECTOR 1	
	BEGINNING I	VECTOR 2	
	BEGINNING J	VECTOR 2	
	END I	VECTOR 2	
	END J	VECTOR 2	

Figure 3-7. Unlinked Vector Packet (Sheet 1 of 4)

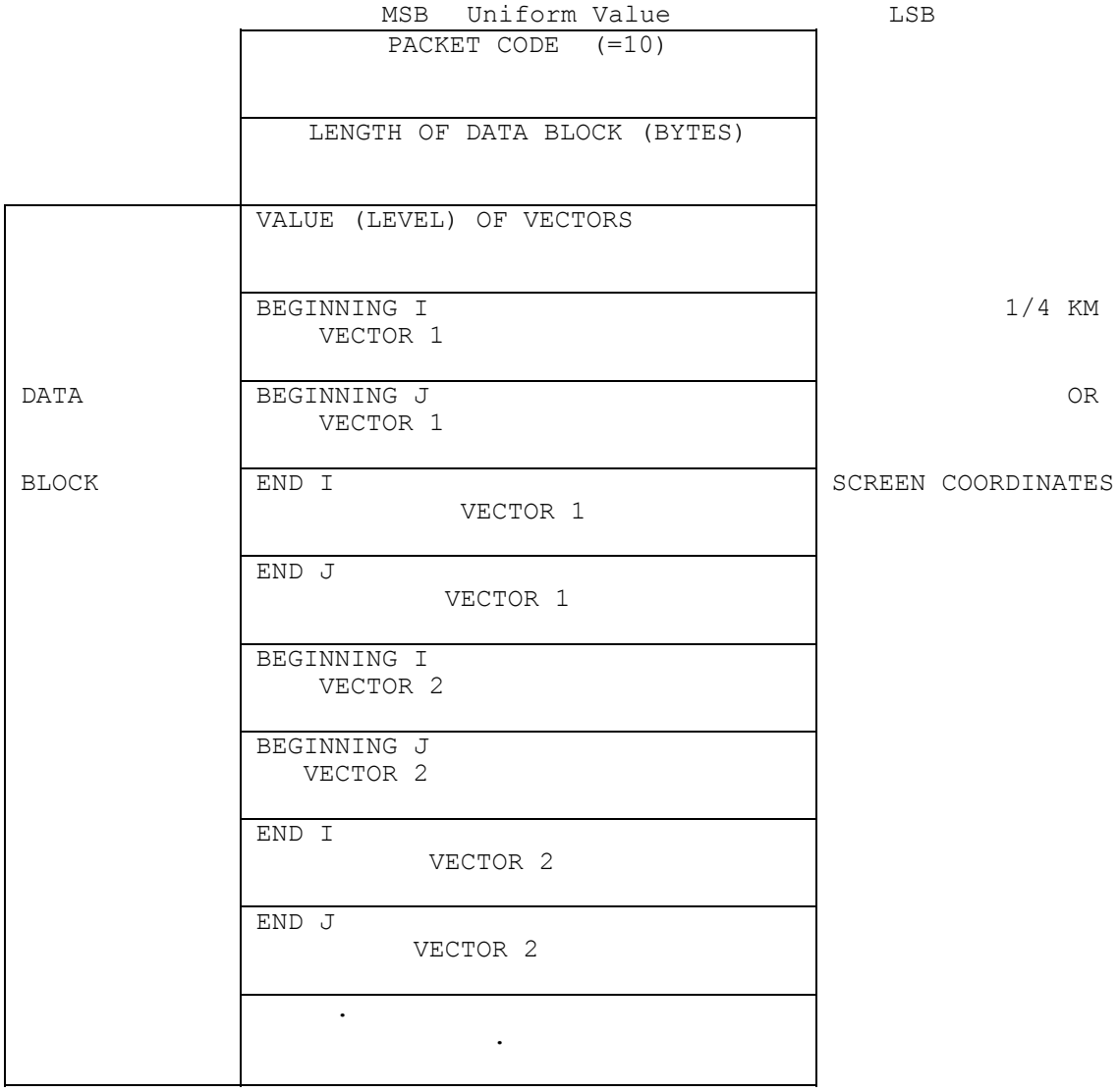


Figure 3-7. Unlinked Vector Packet (Sheet 2 of 4)

No Value

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	7	N/A	Packet Type 7
Length of Block	INT*2	N/A	1 to 32767	1	Number of bytes in block not including self or packet code
Begin I Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector starting point 1
Begin J Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector starting point 1
End 1 Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector end point 1
End J Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector end point 1
Begin I Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector starting point 2
Begin J Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector starting point 2
End I Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector end point 2
End J Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector end point 2

Figure 3-7. Unlinked Vector Packet (Sheet 3 of 4)

Uniform Value

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	10	N/A	Packet Type 10
Length of Block	INT*2	N/A	1 to 32767	1	Number of bytes in block not including self or packet code
Value (Level) of Vector	INT*2	N/A	0 to 15	1	Color Level of Vector
Begin I Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector starting point 1
Begin J Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector starting point 1
End 1 Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector end point 1
End J Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector end point 1
Begin I Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector starting point 2
Begin J Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector starting point 2
End I Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector end point 2
End J Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector end point 2

Figure 3-7. Unlinked Vector Packet (Sheet 4 of 4)

HALF WORD

MSB Linked Vectors LSB

0	E	0	3	Packet Codes / OP Flags Initial Point Indicator
8	0	0	0	
I				
J				
LENGTH = # VECTORS x 4				
I1				
J1				
I2				
J2				

HALFWORD

MSB

Set Color Levels LSB

0	8	0	2	Packet Codes Color Value Indicator
0	0	0	2	
VALUE (LEVEL) OF CONTOUR				

Unlinked Contour Vectors

3	Packet Codes / OP Flags
LENGTH = # VECTORS X 8	
I	
J	
I1	
J1	
I	
J	
I2	
J2	

Figure 3-7a Contour Vector Packet (Sheet 1 of 3)

Set Color Levels:

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	0802 (Hex)	N/A	Packet Type X'0802'
Color Value Indicator	INT*2	N/A	0002 (Hex)	N/A	Indicates that color value is present in this packet
Value (Level) of Contour	INT*2	N/A	0 to 15	1	Color Level of Contour

Linked Contour Vectors:

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	0E03 (Hex)	N/A	Packet Type X'0E03'
Initial Point Indicator	INT*2	N/A	8000 (Hex)	N/A	Indicates that initial point is present in this packet
I Starting point	INT*2	Km/4	-2048 to +2047	1	I coordinate for vector starting point
J Starting Point	INT*2	Km/4	-2048 to +2047	1	J coordinate for vector starting point
Length of vectors	INT*2	Bytes	4 to 32764	Multiples of 4	Length to follow in bytes (where length = # of vectors X4)
End I Vector Number 1	INT*2	Km/4	-2048 to +2047	1	I coordinate for vector end point 1
End J Vector Number 1	INT*2	Km/4	-2048 to +2047	1	J coordinate for vector end point 1
End I Vector Number 2	INT*2	Km/4	-2048 to +2047	1	I coordinate for vector end point 2
End J Vector Number 2	INT*2	Km/4	-2048 to +2047	1	J coordinate for vector end point 2
. . .					
. . .					

Figure 3-7A Contour Vector Packet (Sheet 2 of 3)

Unlinked Contour Vectors:

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	3501 (Hex)	N/A	Packet Type X'3501'
Length of Vectors	INT*2	Bytes	8 to 32760	Multiples of 8	Length to follow in bytes (where length = # of vectors X 8)
Begin I Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector starting point 1
Begin J Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector starting point 1
End 1 Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector end point 1
End J Vector 1	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector end point 1
Begin I Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector starting point 2
Begin J Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector starting point 2
End I Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for vector end point 2
End J Vector 2	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for vector end point 2

Figure 3-7A Contour Vector Packet (Sheet 3 of 3)

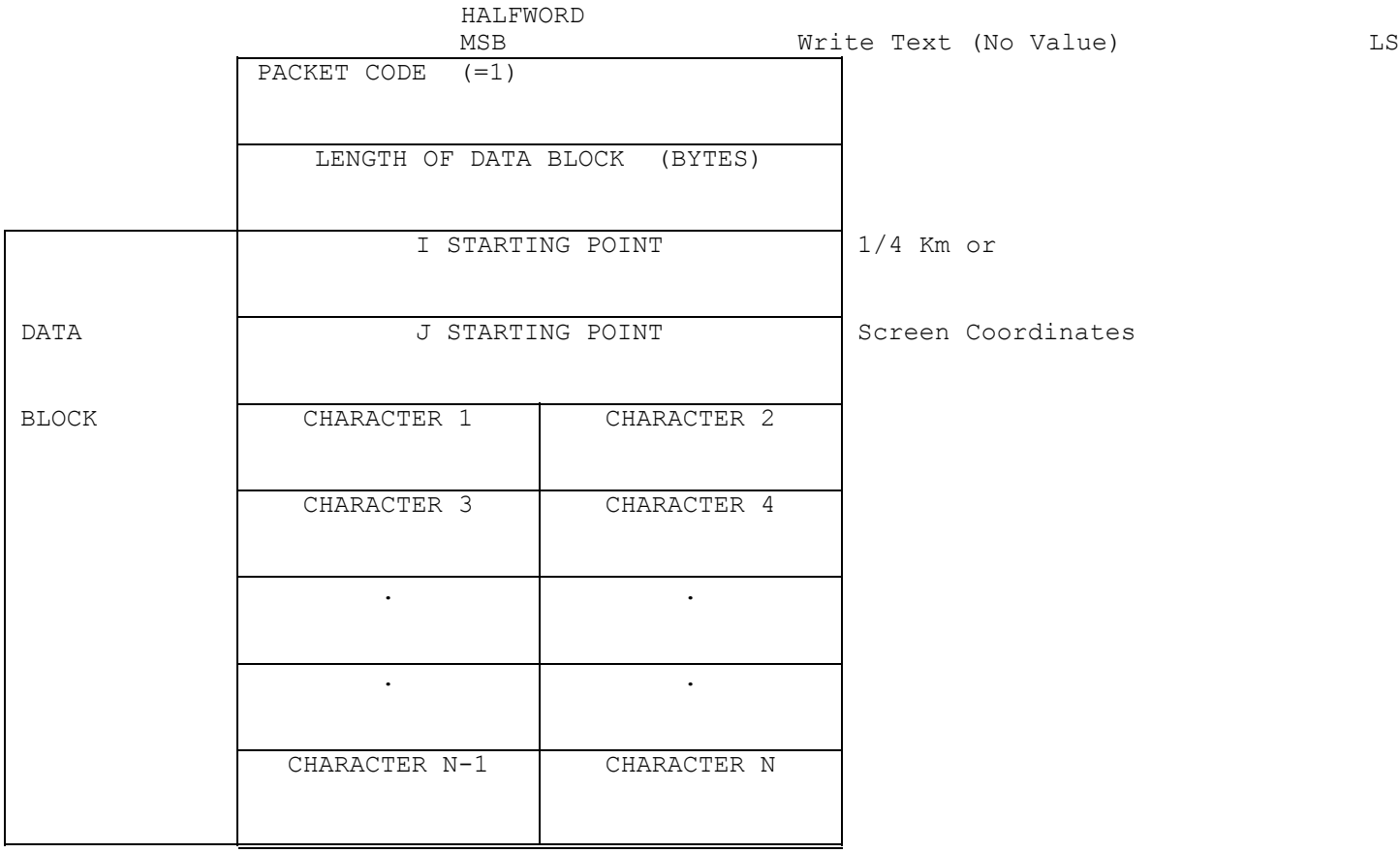


Figure 3-8. Text and Special Symbol Packets (Sheet 1 of 5)

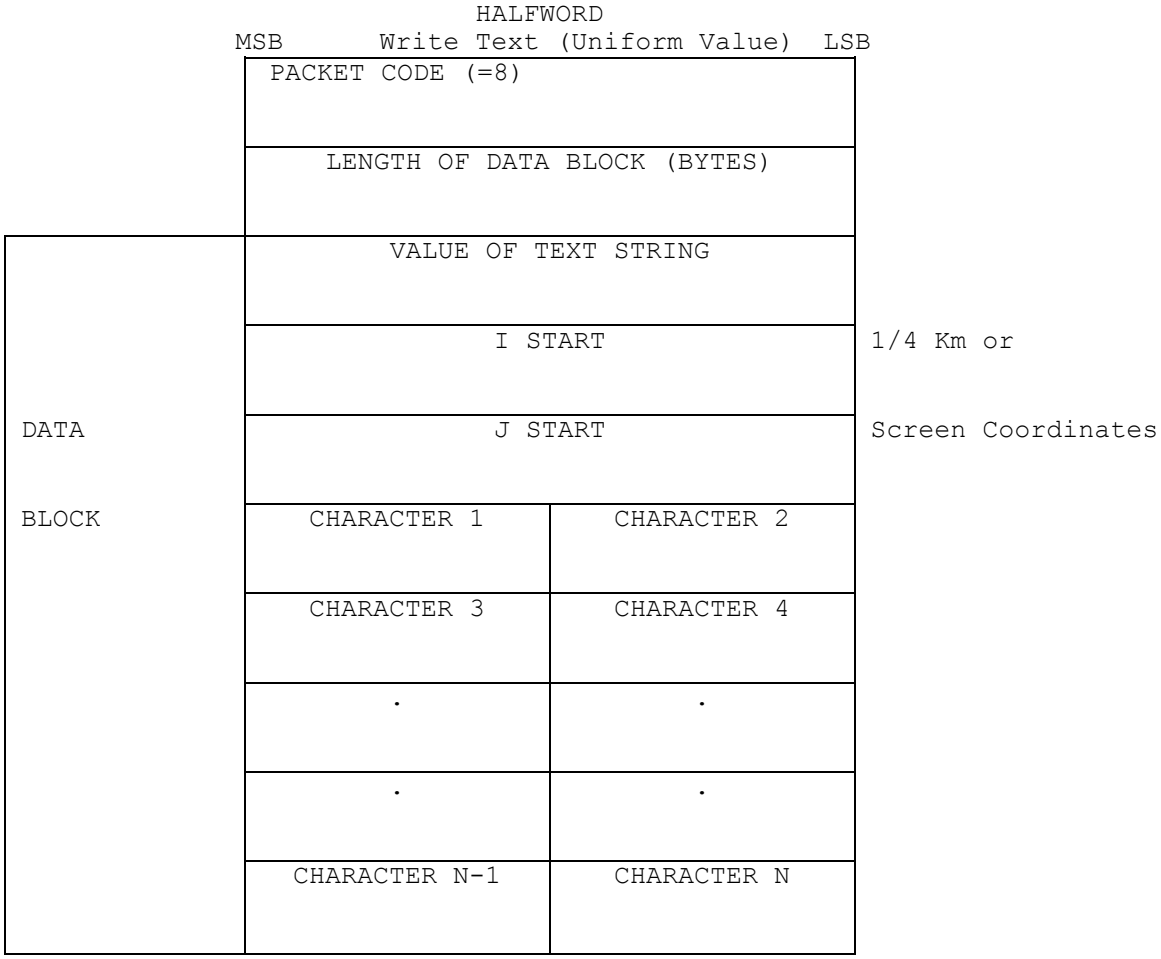


Figure 3-8. Text and Special Symbol Packets (Sheet 2 of 5)

HALFWORD

MSB Write Special Symbols (No Value) LSB

	PACKET CODE (=2)		
	LENGTH OF DATA BLOCK (BYTES)		
DATA BLOCK	I STARING POINT		1/4 Km or Screen Coordinates
	J STARTING POINT		
	CHARACTER 1	CHARACTER 2	
	CHARACTER 3	CHARACTER 4	
	.	.	
	.	.	
	CHARACTER N-1	CHARACTER N	

Figure 3-8. Text and Special Symbol Packets (Sheet 3 of 5)

Write Text (No Value)

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	1	N/A	Packet Type 1
Length of Block	INT*2	N/A	1 to 32767	1	Number of bytes in block not including self or packet code
I Starting Point	INT*2	Km/4 or Pixels	-2408 to +2047	1	I coordinate for text starting point
J Starting Point	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for text starting point
Character 1 to N	Char	8 bit ASCII	ASII Character Set	N/A	Characters are ASCII

Write Text (Uniform Value)

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	8	N/A	Packet Type 8
Length of Block	INT*2	N/A	1 to 32767	1	Number of bytes in block not including self or packet code
Value (Level) of Text	INT*2	N/A	0 to 15	1	Color Level of text
I Starting Point	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for text starting point
J Starting Point	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for text starting point
Character 1 to N	Char	8 bit ASCII	ASCII Character Set	N/A	Characters are ASCII

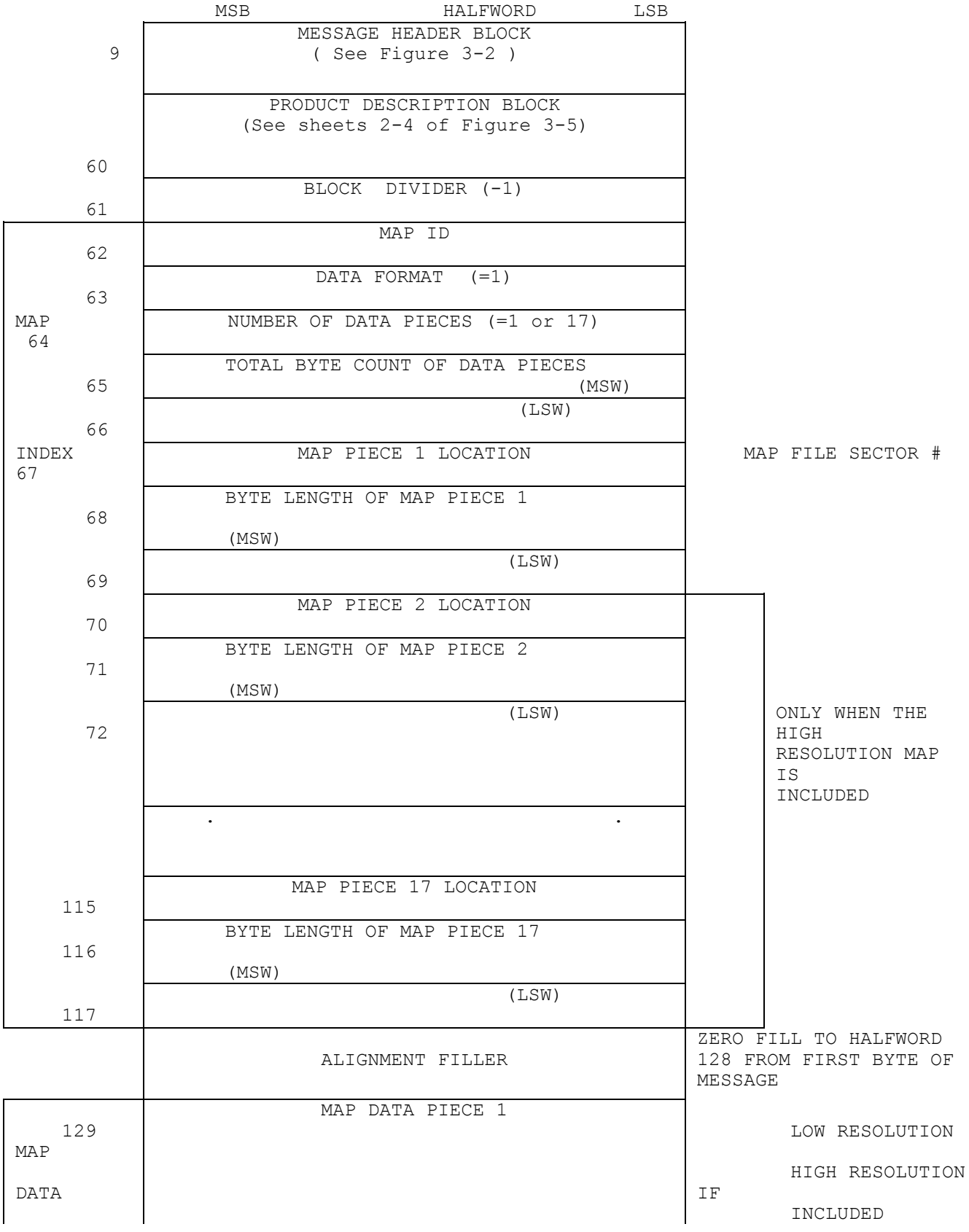
Figure 3-8. Text and Special Symbol Packets (Sheet 4 of 5)

Write Special Symbols (No Value)

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	2	N/A	Packet Type 2
Length of Block	INT*2	N/A	1 to 32767	1	Number of bytes in block not including self or packet code
I Starting Point	INT*2	Km/4 or Pixels	-2048 to +2047	1	I coordinate for special symbol starting point (Note 1)
J Starting Point	INT*2	Km/4 or Pixels	-2048 to +2047	1	J coordinate for special symbol starting point (Note 1)
Character 1 to N	Char	8 bit ASCII	ASCII Character Set	N/A	Characters are ASCII

Note 1. I, J for special symbols are at the center of the symbol and at the upper left corner of the symbol for text.

Figure 3-8. Text and Special Symbol Packets (Sheet 5 of 5)


MSB
HALFWORD
LSB
9
MESSAGE HEADER BLOCK
(See Figure 3-2)
PRODUCT DESCRIPTION BLOCK
(See sheets 2-4 of Figure 3-5)
60
BLOCK DIVIDER (-1)
61
MAP ID
62
DATA FORMAT (=1)
63
MAP
NUMBER OF DATA PIECES (=1 or 17)
64
TOTAL BYTE COUNT OF DATA PIECES
65
(MSW)
(LSW)
66
INDEX
MAP PIECE 1 LOCATION
MAP FILE SECTOR #
67
BYTE LENGTH OF MAP PIECE 1
68
(MSW)
(LSW)
69
MAP PIECE 2 LOCATION
70
BYTE LENGTH OF MAP PIECE 2
71
(MSW)
(LSW)
72
ONLY WHEN THE HIGH RESOLUTION MAP IS INCLUDED
.
.
MAP PIECE 17 LOCATION
115
BYTE LENGTH OF MAP PIECE 17
116
(MSW)
(LSW)
117
ALIGNMENT FILLER
ZERO FILL TO HALFWORD 128 FROM FIRST BYTE OF MESSAGE
MAP DATA PIECE 1
129
LOW RESOLUTION
MAP
HIGH RESOLUTION
DATA
IF
INCLUDED

	MAP DATA PIECE 2
	. .
	MAP DATA PIECE 17

Figure 3-9. Map Message Packet (Sheet 1 of 4)

HALFWORD

MSB Linked Vectors LSB

LSB

0	E	2	
8	0	0	0
I			
J			
LENGTH = # VECTORS X 4			
I1			
J1			
I2			
J2			

Packet Codes / OP Flags

HALFWORD

MSB Text

4	E	0	0
0	C	2	3
8	0	0	0
X			
Y			
LENGTH OF C's			
C1		C2	
C3		C4	

MSB Unlinked Vectors LSB

Special Symbols

3			
LENGTH # X 8			
I			
J			
I1			
J1			
I			
J			
I2			
J2			

LSB

Packet Codes / OP Flags

MSB

4		0	
0	C	2	3
8	0	0	0
X			
Y			
LENGTH OF C's			
C1		C2	
C3		C4	

:

Figure 3-9. Map Message Packet (Sheet 2 of 4)

HALFWORD				RANGE		PRECISION/ ACCURACY
61	Block Divider	INT*2	N/A	-1	N/A	Integer -1, Block Divider
62	Map ID	INT*2	N/A	132 to 198	1	Message code for appropriate map from Table II
63	Data Format	INT*2	N/A	1	N/A	Integer 1 for RAMTEK format
64	Number of Data Pieces	INT*2	N/A	1, 17	1	Integer number of map segments; 1 = low resolution, 17 = high and low resolution
65-66	Total Byte Count	INT*4	N/A	1 to 409600	1	Number of bytes in data pieces
67	Map Piece 1 Location	INT*2	N/A	1 to 32767	1	Map file sector number on RPG disk; offset from the beginning of map file to first piece of data on the disk
68-69	Byte Length of Map Piece 1	INT*4	N/A	1 to 81920	1	The length of piece 1 in bytes
70-117	Note 1	Note 1	Note 1	Note 1	Note 1	Comparable to halfwords 67-69 for map piece 2 to 17; only when the high resolution map is included

Figure 3-9. Map Message Packet (Sheet 3 of 4)

HALFWORD	FIELDNAME	TYPE	UNITS	RANGE	PRECISION / ACCURACY	REMARKS
118-127	Alignment Filler	INT*2	N/A	0	N/A	Zero filled to halfword 128 from first byte of the message
128	Map Data Piece 1	Note 1	Note 1	Note 1	Note 1	Low resolution - contain packets shown in Sheet 2 of this figure
	Map Data Piece 2	Note 1	Note 1	Note 1	Note 1	High resolution if included, contains packet shown in Sheet 2 of this figure
	. . .					
	Map Data Piece 17					

Note 1. Data pieces will be in the formats shown for: Linked Vectors (No Value), Unlinked Vectors (No Value), Write Text (No Value), and Write Special Symbols (No Value). The first 8 bytes will be replaced by the code shown in sheet 2 of this figure. The upper left corner of area of coverage is 0,0 and the resolution is 1/8 Km.

Figure 3-9. Map Message Packet (Sheet 4 of 4)

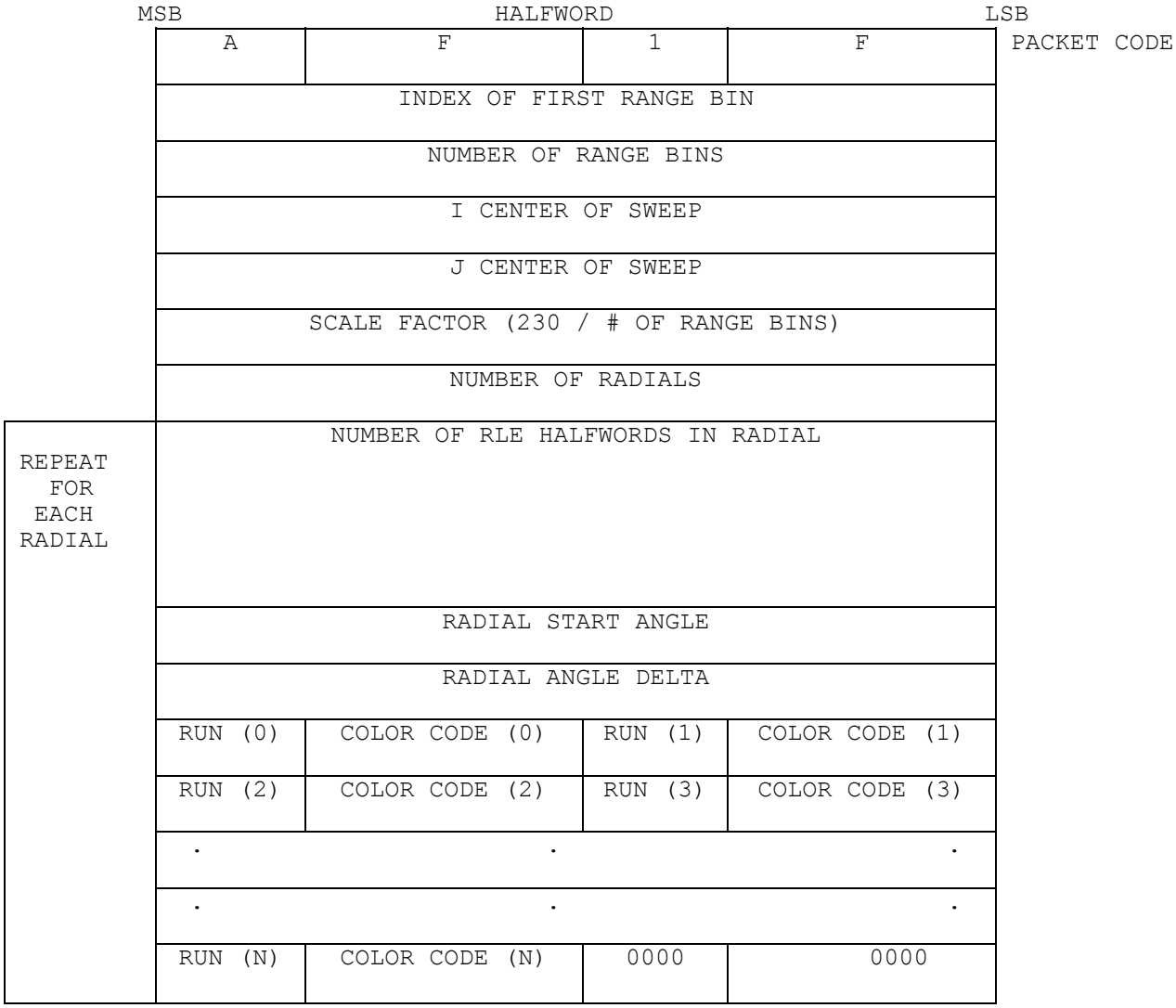


Figure 3-10. Radial Data Packet (16 Data Levels) (Sheet 1 of 2)

Sectors or "Windows" Products will use this format with sufficient data to fill the requested area.

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	AF1F (Hex)	N/A	Packet Type X'AF1F'
Index of First Range Bin	INT*2	N/A	0 to 460	1	Location of first range bin
Number of Range Bins	INT*2	N/A	1 to 460	1	Number of range bins comprising a radial
I Center of Sweep	INT*2	Km/4	-2048 to +2047	1	I coordinate of center of sweep
J Center of Sweep	INT*2	Km/4	-2048 to +2047	1	J coordinate of center of sweep
Scale Factor	Scaled Integer	N/A	.001 to 8.000	.001	Number of pixels per range bin
Number of Radials	INT*2	N/A	1 to 400	1	Total number of radials in products
Number of RLE Halfwords in Radial	INT82	Halfword	1 to 230	1	Number of RLE (Run Length Encoded) 16-bit halfwords per radial
Radial Start Angle	Scaled Integer	Degrees	0.0 to 359.9	.1	Starting angle at which radial data was collected; Scan is always in Clockwise direction
Radial Angle Delta	Scaled Integer	Degrees	0.0 to 2.0	.1	Radial angle data
Run(0)	4 Bit INT	N/A	0 to 15	1	4-bit run code
Color Code(0)	4 Bit INT	N/A	0 to 15	1	4-bit color level

Figure 3-10. Radial Data Packet (16 Data Levels) (Sheet 2 of 2)

	MSB	HALFWORD		LSB	
	B	A	0	F or 7	PACKET CODE / OP FLAGS
	8	0	0	0	
	0	0	C	0	
	I COORDINATE START				
	J COORDINATE START				
	X SCALE INT				
	X SCALE FRACTIONAL				
	Y SCALE INT				
	Y SCALE FRACTIONAL				
	NUMBER OF ROWS				
	PACKING DESCRIPTOR				
REPEAT FOR EACH ROW	NUMBER OF BYTES IN THIS ROW				
	RUN (0)	COLOR CODE (0)	RUN (1)	COLOR CODE (1)	
	RUN (2)	COLOR CODE (2)	RUN (3)	COLOR CODE (3)	
	.		.		
	.		.		
	RUN (N)	COLOR CODE (N)	0000	0000	

Figure 3-11. Raster Data Packet (Sheet 1 of 2)

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	BA0F (Hex) or BA07 (Hex)	N/A	Packet Type X'BA0F' or X'BA07'
Packet Code	INT*2	N/A	8000 (Hex)	N/A	Packet Type X'8000'
Packet Code	INT*2	N/A	00C0 (Hex)	N/A	Packet Type X'00C0'
I Coordinate Start	INT*2	Km/4	-2048 to +2047	1	Starting location of data
J Coordinate Start	INT*2	Km/4	-2048 to +2047	1	Starting location of data
X Scale INT	INT*2	N/A	1 to 67	1	Scaling factor for grid
X Scale Fractional	N/A	N/A	N/A	N/A	Reserved for internal PUP use
Y Scale INT	INT*2	N/A	1 to 67	1	Scaling factor for grid
Y Scale Fractional	N/A	N/A	N/A	N/A	Reserved for internal PUP use
Number of Rows	INT*2	N/A	1 to 464	1	Number of rows in layer
Packing Descriptor	INT*2	N/A	2	N/A	Defines packing format 2
Number of Bytes in this Row	INT*2	N/A	2 to 920	1	Number of bytes in this row not including self
Run(0)	4 Bit INT	N/A	0 to 15	1	4-bit run code
Color Code(0)	4 Bit INT	N/A	0 to 15	1	4-bit color level

Figure 3-11. Raster Data Packet (Sheet 2 of 2)

MSB HALFWORD

LSB

	PACKET CODE (=17)	
	SPARE	
	SPARE	
	NUMBER OF LFM BOXES IN ROW	
	NUMBER OF ROWS	
REPEAT FOR	NUMBER OF BYTES IN ROW	
EACH ROW	RUN (0)	LEVEL (0)
	RUN (1)	LEVEL (1)
	. . .	. . .
	RUN (N)	LEVEL (N)

Figure 3-11a. Digital Precipitation Data Array Packet (Sheet 1 of 2)

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	17	N/A	Packet Type 17
Spares	N/A	N/A	N/A	N/A	
Number of LFM Boxes in Row	INT*2	N/A	131	1	Number of boxes in each row
Number of Rows	INT*2	N/A	131	1	Total number of rows
Number of Bytes in Row	INT*2	N/A	2 to 262	1	Number of bytes in this row
Run(0)	1 Byte	N/A	0 to 255	1	8-bit run code
Level(0)	1 Byte	N/A	0 to 255	1	8-bit data level code. See Note 1 of Figure 3-5 (Sheet 10 of 13)

Figure 3-11a. Digital Precipitation Data Array Packet (Sheet 2 of 2)

	MSB HALFWORD LSB			
	PACKET CODE (=18)			
	SPARE			
	SPARE			
	NUMBER OF LFM BOXES IN ROW			
	NUMBER OF ROWS			
REPEAT FOR EACH ROW	NUMBER OF BYTES IN ROW			
	RUN (0)	LEVEL (0)	RUN (1)	LEVEL (1)
	RUN (2)	LEVEL (2)	RUN (3)	LEVEL (3)
	.	.		.
	.	.		.
	RUN (N)	LEVEL (N)	0000	0000

Figure 3-11b. Precipitation Rate Data Array Packet
(Sheet 1 of 2)

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	18	N/A	Packet Type 18
Spares	N/A	N/A	N/A	N/A	
Number of LFM Boxes in Row	INT*2	N/A	13	1	Number of boxes in each row
Number of Rows	INT*2	N/A	13	1	Total number of rows
Number of Byes in Row	INT*2	N/A	2 to 14	1	Number of bytes in this row
Run(0)	4-Bit INT	N/A	0 to 15	1	4-bit run code
Level(0)	4-Bit INT	N/A	0 to 15	1	4-bit data level code

Figure 3-11b. Precipitation Rate Data Array Packet
(Sheet 2 of 2)

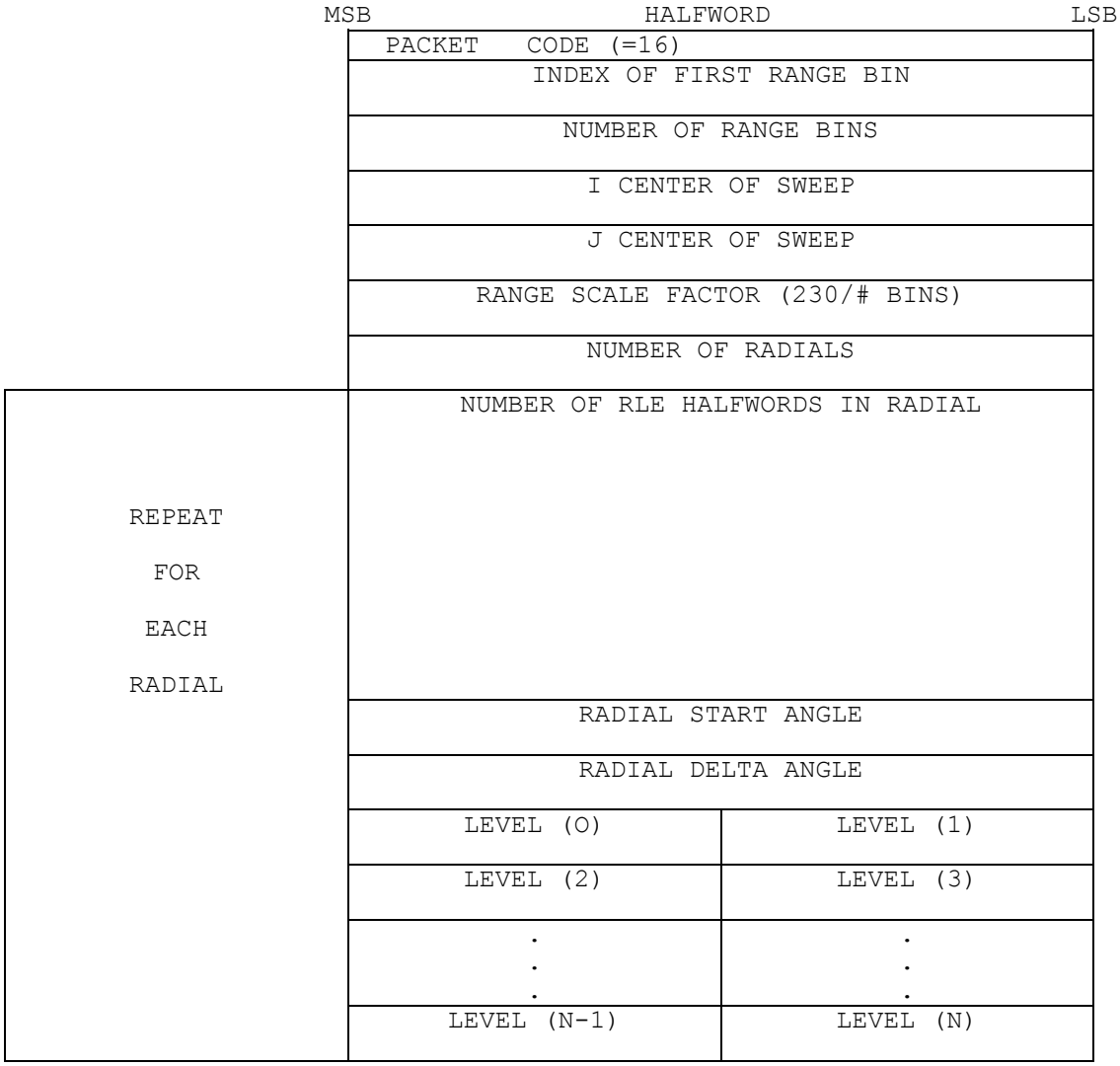
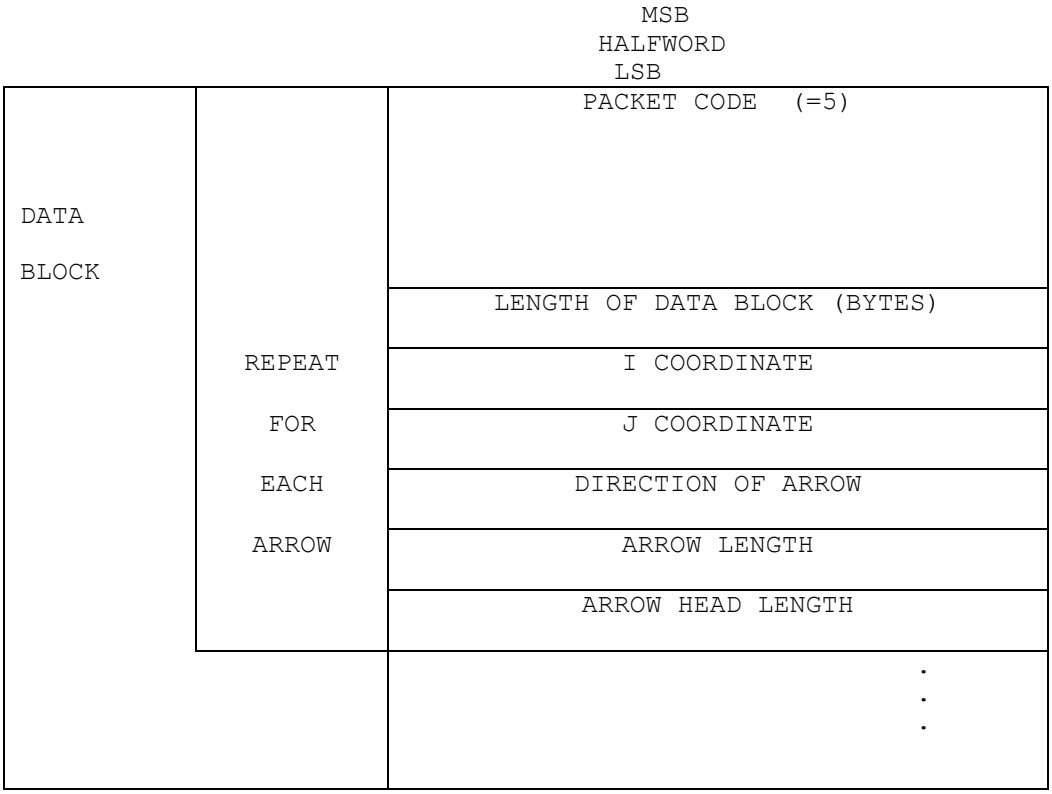


Figure 3-11c. Digital Radial Data Array Packet (Sheet 1 of 2)

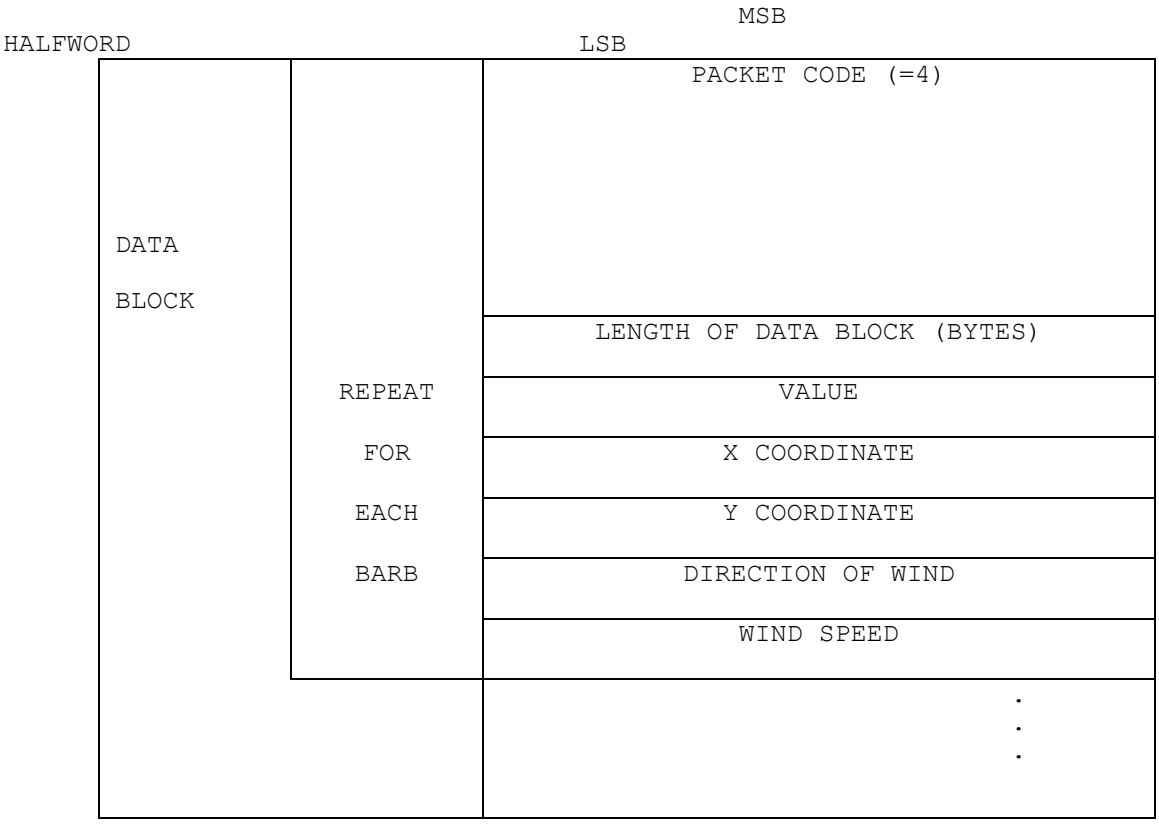
FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	16	N/A	Packet Type 16
Index of First Range Bin	INT*2	N/A	0 to 230	1	Location of first range bin
Number of Range Bins	INT*2	N/A	0 to 230	1	Number of range bins comprising a radial
I Center of Sweep	INT*2	Km/4	-2048 to +2047	1	I coordinate of center of sweep
J Center of Sweep	INT*2	Km/4	-2048 to +2047	1	J coordinate of center of sweep
Range Scale Factor	Scaled Integer	N/A	.001 to 8.000	.001	Number of pixels per range bin
Number of Radials	INT*2	N/A	1 to 400	1	Total number of radials in product
Number of Halfwords in Radial	INT*2	N/A	1 to 230	1	Number of 16-bit Halfwords radial per
Radial Start Angle	Scaled Integer	Degrees	0.0 to 359.9	.1	Starting angle at which radial data was collected; Scan is always clockwise
Radial Delta Angle	Scaled Integer	Degrees	0.0 to 2.0	1	Delta angle from previous radial
Level (0)	1 Byte	N/A	0 to 255	1	8-bit data level code. (See Note 1 of Figure 3-5 Sheet 11 of 14)

Figure 3-11c. Digital Radial Data Array Packet (Sheet 2 of 2)



FIELDNAME		UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	5	N/A	Packet Type 5
Length of Block	INT*2	N/A	1 to 32767	1	Number of bytes in block not including self or packet code
I Coordinate Point	INT*2	Km/4 or Pixels	-2048 to +2047	1	Coordinate where the arrow and/or value is to be centered
J Coordinate Point	INT*2	Km/4 or Pixels	-2048 to +2047	1	Coordinate where the arrow and/or value is to be centered
Direction of Arrow	INT*2	Degrees	0 to 359	1	Arrow direction in 1-degree steps; points with wind field
Arrow Length	INT*2	Pixels	1 to 512	1	Number of pixels in arrow
Arrow Head Length	INT*2	Pixels	1 to 512	1	Number of pixels in arrow head

Figure 3-12. Vector Arrow Data Packet



FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	4	N/A	Packet Type 4
Length of Block	INT*2	N/A	1 to 32767	1	Number of bytes in block not including self or packet code
Value	INT*2	N/A	1 to 5	1	Color level of wind barb (reflects the RMS value associated with the computed velocity)
X Coordinate	INT*2	Km/4 or Pixels	-2048 to +2047	1	Coordinate where the value starts
Y Coordinate	INT*2	Km/4 or	-2048 to +2047	1	Coordinate where the value state

		Pixels			
Direction of Wind	INT*2	Degrees	0 to 359	1	Points into wind
Wind Speed	INT*2	Knots	0 to 195	1	Magnitude of wind

Figure 3-13. Wind Barb Data Packet

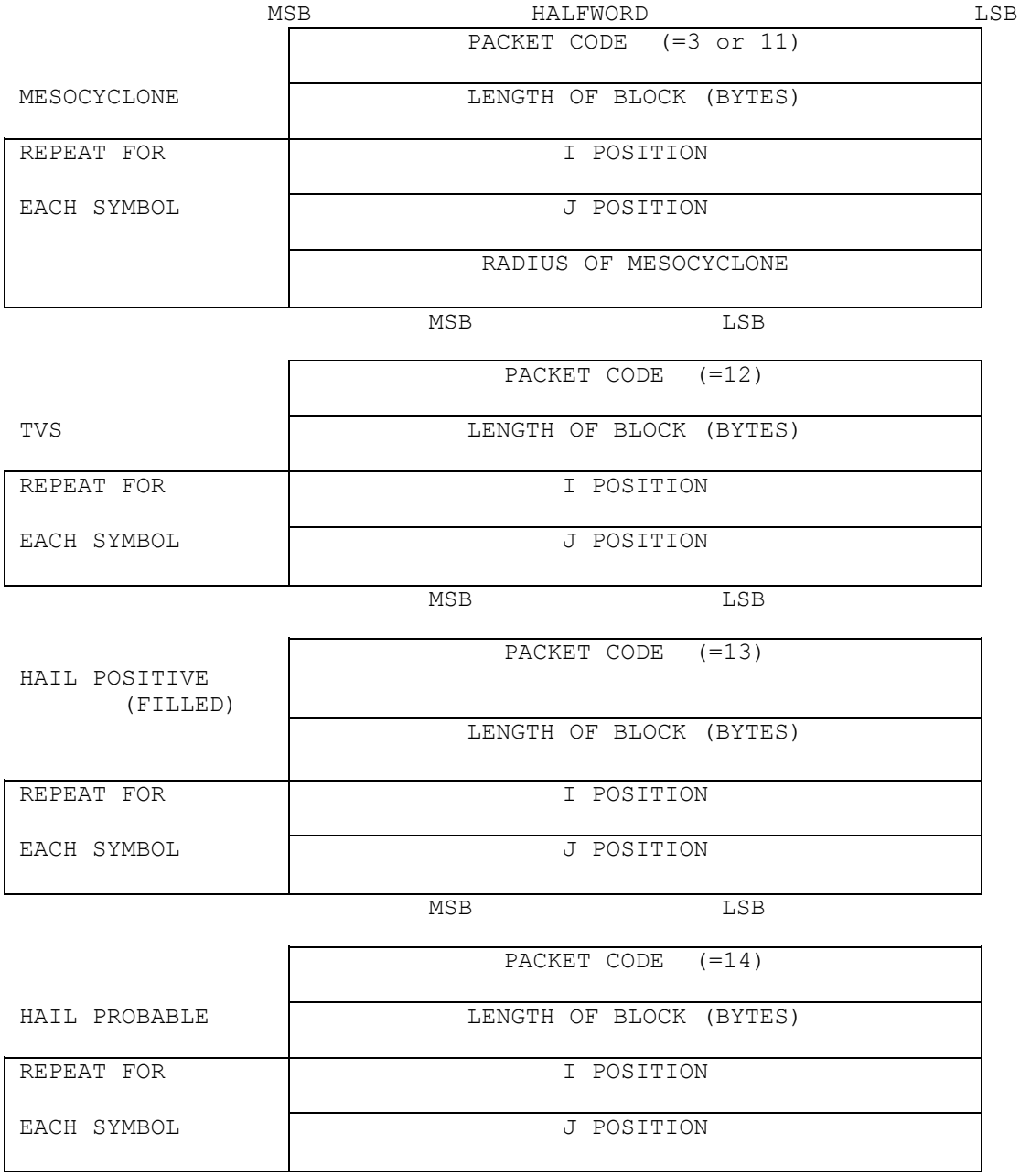


Figure 3-14. Special Graphic Symbol Packet (Sheet 1 of 3)

:
: 77:

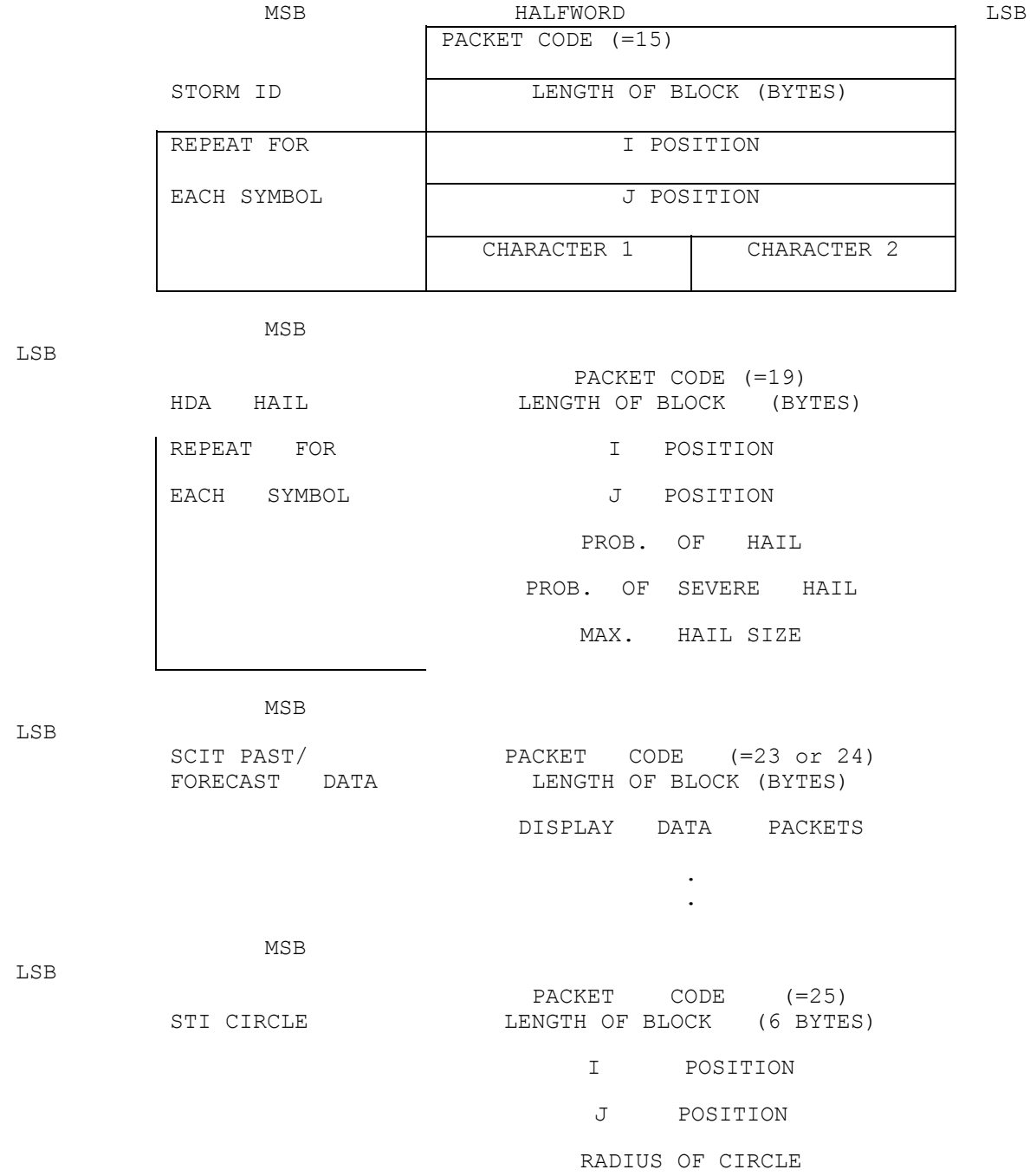


Figure 3-14. Special Graphic Symbol Packet (Sheet 2 of 3)

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Packet Code	INT*2	N/A	3, 11	N/A	Packet Type (Note 1)

			to 15, 19, 23 to 25		
Length of Block	INT*2	Bytes	1 to 32767	1	Number of bytes in block not including self or packet code
I Position	INT*2	Km/4	-2048 to +2047	1	I starting coordinate
J Position	INT*2	Km/4	-2048 to +2047	1	J starting coordinate
Radius of Mesocyclone	INT*2	Km/4	-2048 to +2047	1	A radius of 0 indicates that no mesocyclone is present and I, J coordinates are set to 0,0.
Character 1	Char	8-bit ASCII	A to Z	N/A	First character of Storm ID
Character 2	Char	8-bit ASCII	0 to 9	N/A	Second character of Storm ID
Probability of Hail	INT*2	N/A	0 to 100, -999	10	Probability in Percent (Note 2)
Probability of Severe Hail	INT*2	N/A	0 to 100, -999	10	Probability in Percent (Note 2)
Max Hail Size	INT*2	Inches	0 to 4	1	Maximum expected hail size
Display Data Packet	INT*2	N/A	N/A	N/A	Past or forecast position data for a Single storm cell. Consists of packet code 2, (Figure 3-8), packet code 6*(Figure 3-6) or packet code 25 (Figure 3-14)
Radius of STI Circle	INT*2	Pixels	1 to 512	1	Radius of circle

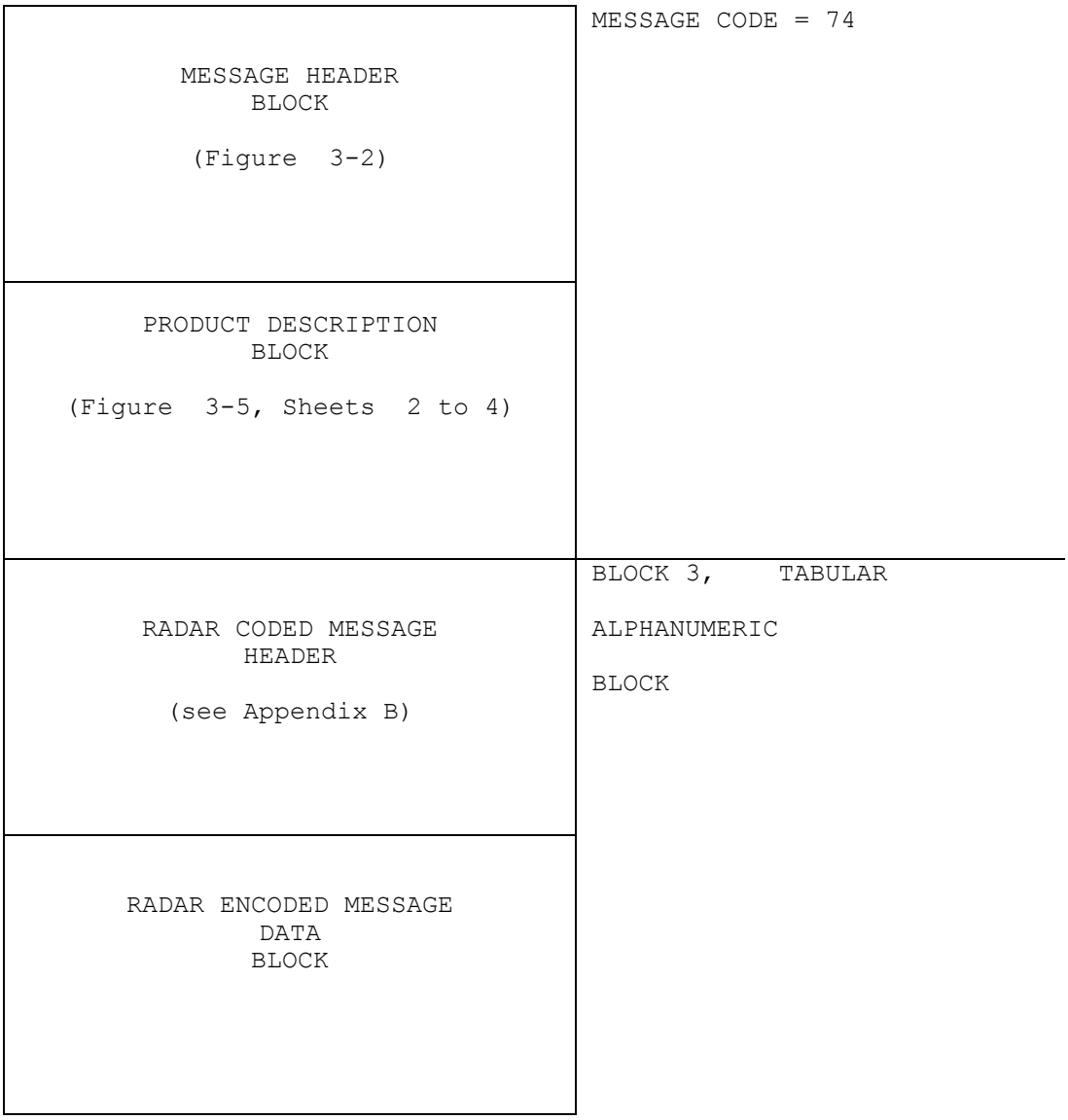
Note 1. A packet code of 11 indicates 3-D correlated shear. Packet code 23 for past position data and packet code 24 for forecast position data.

Note 2. A value of -999 indicates that these cells are beyond the maximum range for algorithm processing.

Figure 3-14. Special Graphic Symbol Packet (sheet 3 of 3)

POST-EDIT VERSION OF THE RADAR CODED MESSAGE

MSB HALFWORD LSB



Note: The Radar Coded Message is encoded as shown in sheets 2 through 4. The ASCII data is formatted 70 characters per line.

Figure 3-22. Radar Coded Message (Sheet 1 of 7)

RADAR CODED MESSAGE COMPOSITE REFLECTIVITY FOR PRE-EDIT VERSION

	MSB HALFWORD LSB			
	LAYER DIVIDER (-1)			
	LENGTH OF LAYER (MSW)			
	(LSW)			
	LAYER ID (=32)			
	NUMBER OF ROWS			
REPEAT FOR	NUMBER OF BYTES IN THIS ROW			
EACH ROW	RUN (0)	COLOR CODE (0)	RUN (1)	COLOR CODE (1)
	RUN (2)	COLOR CODE (N)	RUN (3)	COLOR CODE (3)
	. . .			
	. . .			
	RUN (N)	COLOR CODE (N)	0000	0000

Figure 3-22. Radar Coded Message (Sheet 2 of 7)

RADAR CODED MESSAGE FOR PRE-EDIT VERSION THAT GOES TO THE RPGOP FOR EDITING

MSB HALFWORD LSB	
LAYER DIVIDER (-1)	
LENGTH OF LAYER (MSW)	
(LSW)	
LAYER CODE (=31)	
NUMBER OF CENTROIDS	
PACKET CODE (=15)	
LENGTH OF BLOCK HEREAFTER	
I COORDINATE	
J COORDINATE	
STORM ID C1 | STORM ID C2	
PACKET CODE (=2)	
LENGTH OF BLOCK HEREAFTER	
I COORDINATE	
J COORDINATE	
SYMBOL FOR STORM CENTROID (X"2220")	SPECIAL SYMBOL (CONSTANT)

NOTE: Layer definition for centroids layer of the intermediate graphic product that is part of Radar Coded Message (Message Code = 83). This is only in the pre-edit version of the Radar Coded Message that goes to the RPGOP for editing by the operator.

Figure 3-22. Radar Coded Message (Sheet 3 of 7)
LFM GRID ADAPTATION PARAMETERS FOR PRE-EDIT VERSION OF RADAR CODED MESSAGE

MSB HALFWORD LSB
LAYER DIVIDER (-1)
LENGTH OF LAYER (MSW)
(LSW)
LAYER CODE (30)
ANGLE ROTATION (MSW)
(LSW)
X OFFSET DISTANCE (MSW)
(LSW)
Y OFFSET DISTANCE (MSW)
(LSW)
1/16 LFM GRID BOX SIZE (MSW)
(LSW)
SPARE
SPARE

Figure 3-22. Radar Coded Message (Sheet 4 of 7)

RCM COMPOSITE REFLECTIVITY FOR PRE-EDIT VERSION

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Layer Divider	INT*2	N/A	-1	N/A	Integer value of -1, used to delineate one data layer from another
Length of Layer	INT*4	N/A	1004 to 10204	1	Length of data layer (in bytes) not including layer divider and length field
Layer ID	INT*2	N/A	32	N/A	Constant value of 32 which identifies layer
Number of Bytes in This Row	INT*2	N/A	8 to 100	N/A	Number of bytes encoded for this row
Number of Rows	INT*2	N/A	100	1	Total number of rows in Cartesian grid
Run(0)	4-Bit INT	N/A	0 to 15	1	4-bit run code*
Color Code (0)	4-Bit INT	N/A	0 to 15	1	4-bit color level*

*Run length encoded format for the composite reflectivity data for the pre-edit version of the radar coded message. The encoded data in on an LFM grid.

Figure 3-22. Radar Coded Message (Sheet 5 of 7)
RCM FOR PRE-EDIT VERSION THAT GOES TO THE RPGOP FOR EDITING

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Layer Divider	INT*2	N/A	-1	N/A	Integer value of -1, used to delineate one data layer from another
Length of Layer	INT*4	N/A	Design Dependent	1	Length of data layer (in bytes) not including layer divider and length field
Layer Code	INT*2	N/A	31	N/A	Constant value of 31 which identifies layer
Number of Centroids	INT*2	N/A	0 to 20	1	Total number of centroids detected
Packet Code	INT*2	N/A	15	N/A	Packet Type 15
Length of Block	INT*2	N/A	4 to 32767	1	Number of bytes to follow
I Coordinate	INT*2	Km/4	-2048 to +2047	1	I coordinate for placement of storm ID
J Coordinate	INT*2	Km/4	-2048 to +2047	1	J coordinate for placement of storm ID
Storm ID C1	Char	8-bit ASCII	0 to 9, A to Z	N/A	First character of Storm ID
Storm ID C2	Char	8-bit ASCII	Blank, 0 to 9	N/A	Second character of Storm ID
Packet Code	INT*2	N/A	2	N/A	Packet Type 2
Length of Block	INT*2	N/A	4 to 32767	1	Number of bytes to follow
I Coordinate	INT*2	Km/4	-2048 to +2047	1	I coordinate for storm track symbol
J Coordinate	INT*2	Km/4	-2048 to +2047	1	J coordinate for storm track symbol
Symbol for Storm Centroid	Hex	N/A	2220 (Hex)	N/A	Hexadecimal value for storm centroid symbol

Figure 3-22. Radar Coded Message (Sheet 6 of 7)

LFM GRID ADAPTATION PARAMETERS FOR PRE-EDIT VERSION OF RCM

FIELDNAME	TYPE	UNITS	RANGE	PRECISION/ ACCURACY	REMARKS
Layer Divider	INT*2	N/A	-1	N/A	Integer value of -1, used to delineate one data layer from another
Length of Layer	INT*4	N/A	22	1	Length of data layer (in bytes) no including layer divider and length field
Layer Code	INT*2	N/A	30	N/A	Constant value of 30 which identifies layer
Angle Rotation	Real*4	Degrees	-180 to +180	.01	Angle rotation from North to LFM grid column axis
X Offset Distance	Real*4	Km	0 to 45.00	.01	Distance from the radar to the upper right corner of unrotated MM box (grid box containing the antenna site)
Y Offset Distance	Real*4	Km	0 to 45.00	.01	Distance from the radar to the upper right corner of unrotated MM box (grid box containing the antenna site)
1/16 LFM Grid Box Size	Real*4	Km	8.75 to 11.25	.01	1/16 LFM grid box size in kilometer
Spares	N/A	N/A	N/A	N/A	Two spare halfwords

Figure 3-22. Radar Coded Message (Sheet 7 of 7)

MSB HALFWORDS LSB

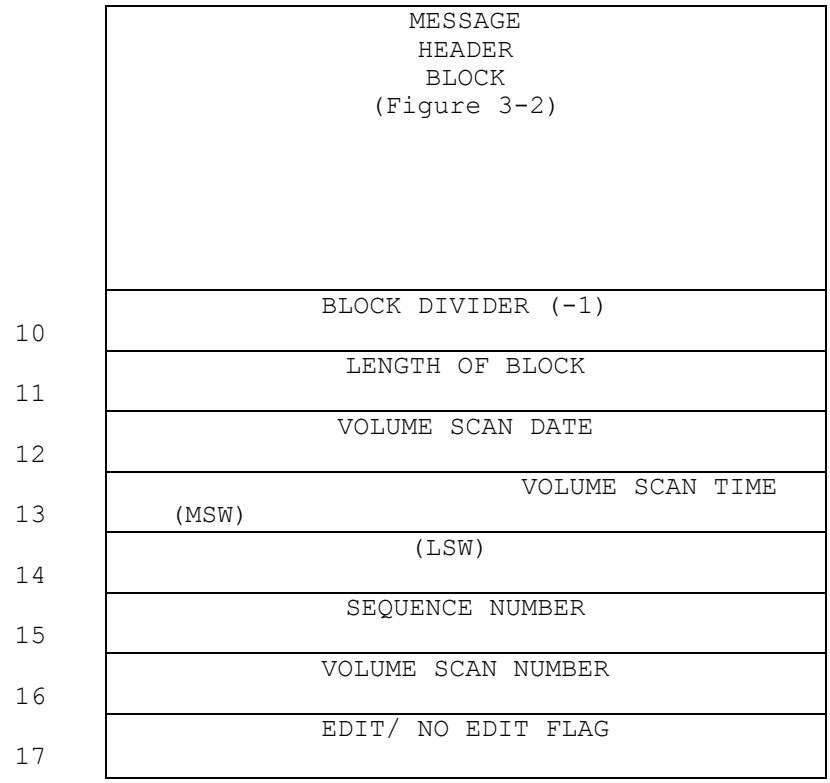


Figure 3-23. Radar Coded Message Edit/No Edit Message (Sheet 1 of 2)

HALFWORD	FIELDNAME	TYPE	UNITS	RANGE	PRECISION / ACCURACY	REMARKS
10	Block Divider	INT*2	N/A	-1	N/A	Integer value of -1, used to delineate the header from the Radar Coded Message Edit/No Edit Message Block
11	Length of Block	INT*2	N/A	12	1	Number of bytes to the end of this block not including block divider and length field
12	Volume Scan Date	INT*2	Julian Date	1 to 32767	1	Modified Julian date; integer number of days from 1 January 1970 (1=1/1/70)
13-14	Volume Scan Start Time	INT*4	Seconds GMT	0 to 86399	1	Number of seconds after midnight Greenwich Mean Time (GMT)
15	Sequence Number	INT*2	N/A	0 to 32767	1	Monotonically increasing number for tracking RCM Edit/No Edit messages
16	Volume Scan Number	INT*2	N/A	1 to 80	1	Identifies the volume scan number for which this message was generated
17	Edit/No Edit Flag	INT*2	N/A	0,1	N/A	0 = Not editing 1 = PUP will edit message

Figure 3-23. Radar Coded Message Edit/No Edit Message (Sheet 2 of 2)**Appendix**

A. Glossary

Acronym/Abbreviation	Description
A	Address Sequence
ABM	Asynchronous Balanced Mode
ACCUM	Accumulation
ADAPT	Adaptation
ADM	Asynchronous Disconnect Mode
ALT	Altitude
ANSI	American National Standards Institute
ARO	Asynchronous Respond Opportunity
ASCII	American Standard Code for Information Interchange
AZ	Azimuth
BA	Balanced, Asynchronous Balanced Mode (Same as ABM)
Beg	Beginning
Bit	Binary Digit
Block	A related set of bytes containing control information or data. A block is a component of a message.
bps	Bits per second
C	Control Sequence
Cal	Calibration
CALIB	Calibration
CCITT	Consultative Committee International Telephone and Telegraph
Char	Character
CKT	Circuit
CLIN	Contract Line Item Number
CM	Cubic Meters
Comp	Composite
Const	Constant
CPC	Calcomp Pen Command

CPCI	Computer Program Configuration Item
CPU	Central Processor Unit
CRC	Cyclical Redundancy Checking
dBZ	Reflectivity, in decibels
DCE	Data Circuit-Terminating Equipment
deg	Degree
Dig	Digital
Dir	Direction
DISC	Disconnect
DM	Disconnected Mode
DTE	Data Terminal Equipment
EIA	Electronic Industries Association
Err	Error
Ext	External
F or Flag	Flag Sequence
FCS	Frame Check Sequence
Flg	Flag
Frame	A segment of a bit stream bounded by a uniquely recognizable bit sequence and containing a specified number of bits or bytes of data.
FRMR	Frame Reject
GFS	General Format Specifier
GMT	Greenwich Mean Time
Halfword	Two bytes (16 bits)
Header	A set of bits or bytes contained in a bounded segment of information which provides a label or control information to the remaining contents of the segment.
Hgt	Height
Hword	Halfword (16 bits)
I	Information
I-field	Information field

I-frame	Information frame
ICD	Interface Control Document
ID	Identification
IEB	Industrial Electronics Bulletin
INT*2	One halfword of integer data in standard 2's compliment format
INT*4	One fullword (32 bits) of integer data in standard 2's compliment format
Int	Integer
Integ	Integrated
Integer	Bit stream of 1s and 0s, represented as an integer number, not formatted in 2's compliment format (i.e., 32,768 integer code would represent setting the MSB of a halfword).
ISO	International Organization for Standardization
ITS	Information Transfer State
kg	Kilogram
km	Kilometer
kfs	Kilofeet
kts	Knots
LAPB	Link Access Procedure, Balanced
LCG	Logical Channel Group
LDS	Logically Disconnected State
LFM	Limited Fine Mesh
Liq	Liquid
LSB	Least Significant Bit
LSW	Least Significant Word
MAX	Maximum
Message	The complete set of information transported from the source to the destination. A message may be a product, product request, data, data request, or NEXRAD control information.

MSB	Most Significant Bit
Msg	Message
MSL	Mean Sea Level
MSW	Most Significant Word
N(r)	Receive sequence variable
N(s)	Send sequence variable
NMI	Nautical Mile
N/A	Not Applicable
NAVAIDS	Navigational Aids
Neg	Negative
NEXRAD	Next Generation Weather Radar
Num	Number
NTR	NEXRAD Technical Requirements
OP	Operation
OS	Operating System
0SI	Open Systems Interconnection
PDB	Product Description Block
Pos	Positive
Prec	Precipitation
Prob	Probability
Product	A collection of information that is self contained and provides a complete representation of a graphical image or an alphanumeric message.
PUP	Principal User Processor Group
PVC	Permanent Virtual Circuit
RAD	Radial
RCM	Radar Coded Message
RDA	Radar Data Acquisition Group
Real*4	One fullword (32 bits) of real data, where the MSB is the Sign-bit, followed by a 7 bit Exponent and a 24 bit Mantissa
Reflect	Reflectivity

Reflect.Calib.Corr.	Reflectivity Calibration Correction
REJ	Reject
RES	Resolution
RFC	River Forecast Center
RGDAC	Rain Gage Data Acquisition Computer
RLE	Run Length Encoded
RMS	Root Mean Square
RNR	Receiver Not Ready
RPG	Radar Product Generation Group
RPGOP	Radar Product Generator Operational Position
RR	Receiver Ready
SABM	Set Asynchronous Balanced Mode
Scaled Integer	Integer values with an assumed decimal point whose position is defined by the precision of the item
SCN	Specification Change Notice
Sec	Second
sq	Square
Spd	Speed
SPR	Software Problem Report
SR	Signaling Rate Selector
SW	Spectrum Width
SWP	Severe Weather Probability
TAB	Tabular
TM	Test Mode
Turb	Turbulence
TWA	Two-Way Alternate Transmission
TWS	Two-Way Simultaneous Transmission
UA	Unnumbered Acknowledgement
UCP	Unit Control Position
UI	Unnumbered Frame

VAD	Velocity Azimuth Display
Var	Variation
Vel	Velocity
VIL	Vertically Integrated Liquid
VME	Versa Module Eurocard
VMECS	Versa Module Eurocard Communication Subsystem
Wd	Width
ZBID	Zero-Bit Insertion and Deletion

Appendix B. Radar Coded Message

Header

The header is encoded as follows:

ccc	The communications node (PUP site identifier).
ROBEE	The product category for edited radar coded message.
ROBUU	The product category for unedited radar coded message.
sidd (C/R)	Four-letter RDA site identifier. (Example: cccROBEE sidd (C/R))

Part A of the message is encoded as follows:

/NEXRAA	Part A indicator.
sidd	Four letter RDA site identifier.
ddmmyytttt	The day (dd) of the month (mm), the year (yy) and the time (tttt) to the nearest minute in Greenwich Mean Time (GMT).
edited or unedited	Status of message.
RADNE	A group to encode no reportable reflectivity intensity values shall be provided; i.e., field NInnnn is zero. This shall be corrected after graphic editing.
RADOM	A group to encode radar down for maintenance shall be provided.

/Mdnnnn A group of six characters to encode operational mode shall be provided. Choices are PCPN and CLAR. (Example: /MDPCPN)

/SCnnnn A group of six characters to encode scan strategy shall be provided. Refer to Appendix I of NTR. Choices are 1405 (14 scans in 5 minutes), 0906, 0510, etc. (Example: /SC1405)

/NInnnn The total number (nnnn) of intensities (NI) reported in the following field (gggi) shall be encoded. This group shall be corrected after editing, if editing is performed (Example: /NI0144)

gggi Reflectivity intensity shall be mapped onto the 1/16 LFM grid (ggg). Encode locations and intensities by a series of groups made up of three letters (1/16 LFM) followed by the maximum intensity of the designated grid box. The three letters (in order) shall be row, column, and sub-grid. The

numbers following represent intensities in succeeding sub-grid boxes in that row; that is, encode each 1/16 LFM grid box from west to east, starting with the northern-most row with data, followed by the next southern row, etc. In the interest of compacting the message, successive intensities of different or similar values may be listed after a single location as long as the intensities are continuous. When succeeding grid boxes contain the same intensity value, the number of succeeding boxes with the same value may be designated by a letter of the alphabet; that is, if four succeeding 1/16 LFM grid boxes (a total of five boxes) are at level 2, they could be coded as GGG2D. The "2D" may also. be followed by different intensity values. Location/intensity groups shall be separated by a comma. (Example: ABF112D33l, BCA1211)

/MThhh:ggg The location and height (MSL) of the maximum echo top (MT) within 230 km radius of the radar shall be encoded using the three-letter grid designator (ggg) and assigning the height coinciding with echo top product in hundreds of feet (hhh). (Example: /MT320:NLB)

/NCENnn: The total number (nn) of centroids (NCEN) reported in this portion of the message shall be encoded. This number shall correspond to the corrected centroids below. (Example: /NCEN04:)

Cnnggg dddfff The centroid © number (nn), location (grid box) (ggg), direction from which it is moving (in 1-degree increments) (ddd), and its speed (fff) in knots, shall be encoded. Successive groups shall be separated by commas. If, during editing, data are deleted in a grid box that contains a centroid, this group shall be corrected by deleting this centroid. (Example: C03QMB240012)

/ENDAA(C/R) A group to indicate the end of Part A.

The following is a summary example of the components of Part A:

/NEXRAA sidd 2812881330 EDITED (C/R)

/MDnnnn /SCnnnn /NInnnn:

gggiii. . .i,gggiii...1

/MThhh:ggg

/NCENnn: Cnnggg dddfff, Cnnggg dddfff

/ENDAA (C/R)

Part B: VAD Winds

:

Part B of the RCM contains a single profile of the horizontal wind information derived from the output of the VAD algorithm. Part B of the message is encoded as follows:

/NEXRBB	Part B indicator.
sidd	Four letter RDA site identifier.
	ddmmyytttt The day (dd) of the month (mm), the year (yy), and the time (tttt), to the nearest minute, in GMT.
VADNA	The optional entry VADNA shall be encoded for instances when no VAD wind data available for the last 15 minutes, if appropriate.
	hhhcdddfff Coded heights (hhh) in hundreds of feet MSL; confidence © level, using RMS for the coded height; wind direction (ddd) and wind speed (fff), in knots, shall coincide with those derived from the VAD Winds product. The confidence level shall be encoded as a single letter in accordance with the following:

A = RMS of 2 kts; B = RMS of 4 kts;
C = RMS of 6 kts; D = RMS of 8 kts;
E = RMS of 10 kts; F = RMS of 12 kts;
G = RMS of greater than or equal to 14 kts.

Wind direction and speed, as output from the VAD Algorithm, shall be reported at up to 19 heights, in feet MSL. Default heights are:

1,000	6,000	12,000	25,000
2,000	7,000	14,000	30,000
3,000	8,000	16,000	35,000
4,000	9,000	18,000	50,000
5,000	10,000	20,000	

(Example: 080C240060)

/ENDBB (C/R) End of Part B indicator.

The following is a summary example of the components of Part B:

/NEXRBB sidd 2812881330 (C/R)

hhhcdddfff ,hhhcdddfff ,hhhcdddfff

/ENDBB (C/R)

Part C: Remarks

Part C of the Radar Coded Message contains remarks in an alphanumeric format. Automatically generated remarks provide information on the locations of tornadic vortex signatures, mesocyclones, centroids, storm tops and hail

indices. The automated portion of Part C is encoded as follows:

/NEXRCC	Part C indicator.
sidd	Four letter RDA site identifier.
ddmmyytttt	The day (dd) of the month (mm), the year (yy) and the time (tttt) to the nearest minute in GMT.
/NTVSnn:	The total number (nn) of Tornado Vortex Signatures (NTVS) detected by the TVS algorithm and reported in Part C shall be encoded (Example: /NTVSO3:).
TVSnnggg	The location (ggg) and number identifier (nn) of each Tornado Vortex Signature (TVS) shall be encoded using the three-letter grid box designator (Example: TVS02NLB).
/NMESnn:	The total number (nn) of mesocyclones and areas of uncorrelated shear (NMES) detected by the Mesocyclone Detection algorithm and reported in Part C shall be encoded (Example: /NMESO5:).
Mnnggg:	The location (ggg) and number identifier (nn) of each mesocyclone or area of uncorrelated shear (M) shall be encoded using the three-letter grid box designator (Example: M03JLC).
/NCENnn:	The total number (nn) of centroids (NCEN) reported in Part C shall be encoded (Example: /NCENO8:).
Cnnggg ShhhHi	The height (hhh) in hundreds of feet (MSL), of the storm top (S), as derived from the Storm Structure algorithm, for each centroid © identified in Part A to include location (ggg) shall be encoded. The centroid identifier number (nn) is the same as given in Part A. The hail (H) index (I), as provided by the Hail algorithm, is also given as one of the four following data levels: N - no hail; P - possible or probable hail; H - hail; U - unknown (Example: C04QQD S440HP).

In addition to the automatically generated remarks, Part C provides for optional manual entries. A template is provided containing the fixed part of the groups listed below. The only groups to be sent are those to which data are added. It should be noted that the absence of a remark does not imply that the phenomenon does not exist.

/PCTRyyyy,aaa:gg	Precipitation type and intensity trend. Precipitation type (yyyy) may be coded for a representative area of the display. The type is variable and up to four characters in length. The intensity trend (aaa) is also variable in length and up to three characters in length. The location (gg) is reported using the two

letter identifier for the 1/4 LFM grid.

For convective echo systems, the characteristic type of precipitation as defined as that type associated with the maximum observed intensity. For non-convective echo systems, the type of precipitation is defined as that type predominant in horizontal extent. If precipitation is reaching the surface, report that type. Precipitation types are:

Precipitation	Symbol
Rain	R
Rain Shower	RW
Freezing Rain	ZR
Freezing Rain Shower	ZRW
Snow	S
Snow Shower	SW
Drizzle	L
Freezing Drizzle	ZL
Ice Pellet	IP
Ice Pellet Shower	IPW

Designate areas believed to be associated with thunderstorms with the symbol T preceding the precipitation symbol.

Evaluate the intensity trend in terms of the net Change in the characteristic intensity during a period of 1 hour for lines and areas and 15 minutes for cells.

Report the intensity trend as increasing (+) or decreasing (-), if during the period, the net change in characteristic intensity (dBZe) changes from one intensity level to another.

If the net change in the characteristic intensity during the period does not change categories, report the intensity trend as NC (no change).

Report echo systems as NEW (new development) if they originated during the period specified above. Areas or lines that develop from a cell or cells during the hour preceding the report shall be reported as NEW.

For a mixed system, consisting of a liquid characteristic type of precipitation and a frozen secondary type, report the intensity trend of the liquid precipitation.

Intensity trend symbols are:

Symbol	Trend
+	Increasing
-	Decreasing
NC	No Change
NEW	New

(Example: PCTRRW,NEW:LO,LP)

/LEWP:gg A line echo wave pattern (LEWP) shall be encoded using the two letter 1/4 LFM grid box location (gg) (Example: /LEWP:KJ,LK,MK,NK,OK,PL).

/BASEhhh:gg The base of an elevated layer (BASE) shall be encoded in hundreds of feet (hhh) (MSL) using the two letter

identifier for the 1/4 LFM grid location (gg) (Example: /BASE090:LO,MO).

/MALFhhh:gg The occurrence of precipitation which is mostly aloft (MALF) shall be encoded. The height (hhh) is reported in hundreds of feet (MSL) and the location (gg) is the 1/4 LFM grid identifier (Example: /MALF050:KP,KQ).

/PALFhhh:gg The occurrence of precipitation which is partially aloft (PALF) shall be encoded. The height (hhh) is reported in hundreds of feet (MSL) and the location (gg) is the 1/4 LFM grid identifier (Example: /PALF050:PM,PN).

/MLTLVLhhh The height (hhh) of the melting level (MLTLVL) in hundreds of feet (MSL) shall be encoded (Example: /MLTLVL075).

/EYEdddfffcc:ggg; The location (ggg) of the eye of a hurricane or tropical storm (EYE), the (LATeee.ex, direction (ddd) from which it is moving and the speed (fff), in knots,LONeee.ey of movement shall be encoded. Confidence in the fix (cc) is reported as good (GF), fair (FF), or poor (PF). Further, the location of the eye shall also be encoded in latitude (LAT) and longitude (LON). The location shall be expressed in whole degrees and tenths (eee.e) with provision for specifying north (N), south (S), east (E), or west (W) as appropriate. (Example: /EYEl600l0GF:00A;LAT28.4N, LON178.5W).

/CNTRdddfff:ggg; The location (ggg) of the center of a hurricane or tropical storm (CNTR),
LATeee.ex the direction (ddd) from which it is moving and the speed (fff) of movement,
LONeee.ey in knots, shall be encoded. Further, the location of the center shall also be encoded in latitude (LAT) and longitude (L0N). The location shall be expressed in whole degrees and tenths (eee.e) with provision for specifying north (N), south (S), east (E), or west (W) as appropriate. (Example: /CNTR160005:00A;LAT28.4N;LON178.5W)

/REM: This space is for any other remarks not covered in the above remarks.

/EDITED:int If the radar coded message has been edited (EDITED) the editor shall report such, adding his/her initials (int) (Example: /EDITED:DSS).

/ENDCC (C/R) End of Part C indicator

The following is a summary example of the components of Part C:

/NEXRCC sidd 2812881330 (C/R)

/NTVSnn: TVSnnggg,TVSnnggg,TVSnnggg

/NMESnn: Mnnggg,Mnnggg,Mnnggg

/NCENnn: Cnnggg ShhhHi,Cnnggg ShhhHi,Cnnggg ShhhHi

/PCTRyyyy,aaa:gg

/LEWP:gg,gg,gg,gg

/BASEhhh:gg,gg,gg

/MALFhhh:gg,gg

/PALFhhh;gg,gg

/MLTLVLhhh

/EYEdddfffcc:ggg;LATeee.ex,LONeee.ey

/CNTRdddfff:ggg;LATeee.ex,LONeee.ey

/REM:

/EDITED:int

/ENDCC (C/R)

At the end of the message, the following group is sent:

/ENDALL (C/R) A group to indicate end of message shall be provided.

3. Start Date: 19928024 1231Z

4. Stop Date: Ongoing.

5. Coverage: North America

a. Southernmost Latitude: 24 36 N
b. Northernmost Latitude: 48 11 N
c. Westernmost Longitude: 122 30 W
d. Easternmost Longitude: 70 15 W

6. How to Order Data:

Ask NCDC's Climate Services about the cost of obtaining this data set.
Phone: 828-271-4800
FAX: 828-271-4876
E-mail: **NCDC.Orders@noaa.gov**

7. Archiving Data Center:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

8. Technical Contact:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

NWS/Operational Support Facility
Applications/Operations Branch
1200 Westheimer Dr.
Norman, OK 73069
Phone: (405) 366-6530

9. Known Uncorrected Problems: None.

10. Quality Statement: The WSR-88D is a very complex system. Program modifications and engineering changes are rather constant features during the phase-in and upgrade processes. Special care must be taken to ensure that illegal configurations do not contaminate any summaries or statistical studies.

NCDC will be glad to assist in solving problems encountered in reading the data, but technical questions about the data themselves must be addressed to the:

NWS/Operational Support Facility
Applications/Operations Branch
1200 Westheimer Dr.
Norman, OK 73069
Phone: (405) 366-6530
FAX: (405) 366-6550

11. Essential Companion Datasets: None.

12. References: NWS Interface Control Document for RPG/Associated PUP #2620001. No additional information provided with original documentation, but definitive information about all aspects of the Doppler radar is contained in Federal Meteorological Handbook -11 (FMH-11), Volumes A through D. These may be ordered from the National Climatic Data Center.